OCTOBER 1963 35 CENTS ICD

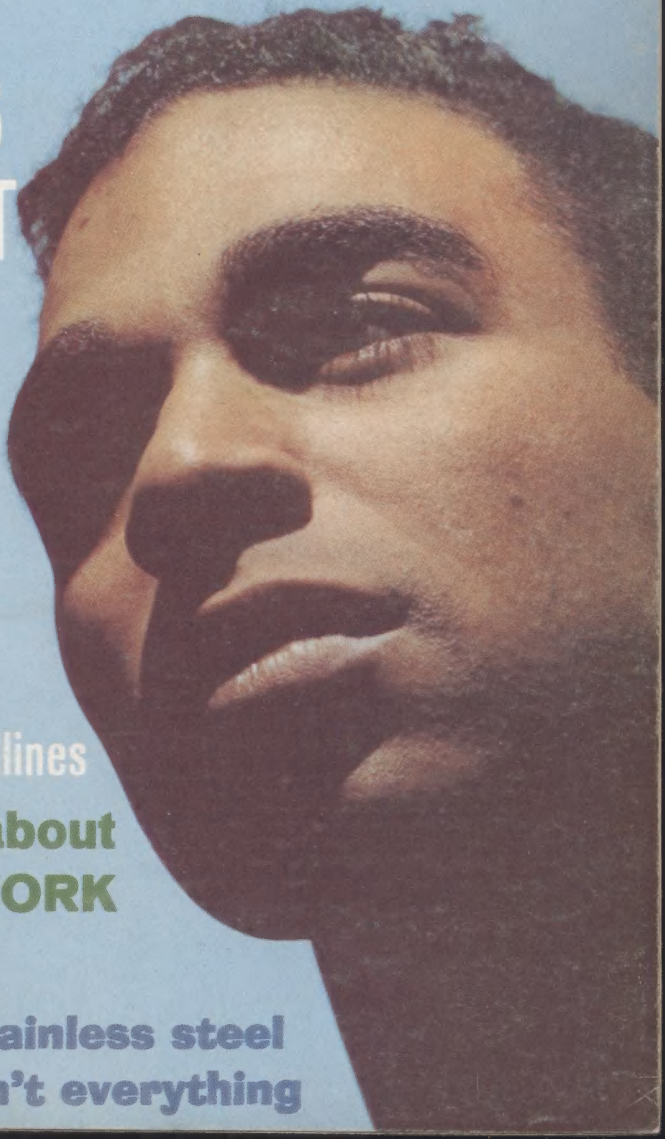
# SCIENCE DIGEST

## WHAT MAKES YOU HAPPY

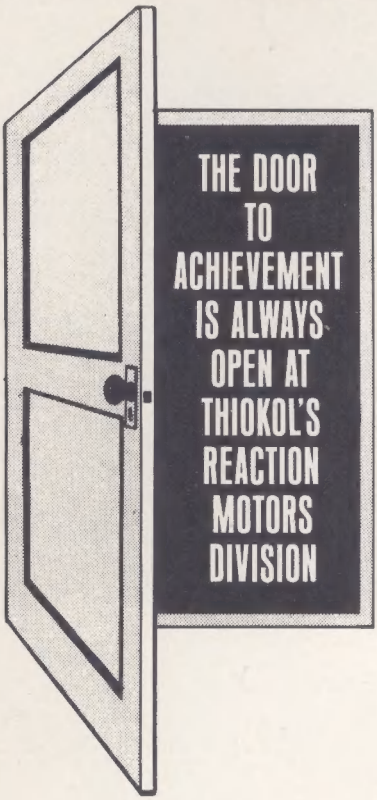
The Negro
HOW HE'S DIFFERENT
WHY WHITES FEAR HIM
— A blunt, scientific look behind the headlines

New facts about
WOMEN, WORK
MARRIAGE

SHAVING: Stainless steel isn't everything



# AEROSPACE ENGINEERS

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# SCIENCE DIGEST

Twenty-seventh year of publication

We will understand today's disturbing "Negro problem" only when we know the biological, sociological and psychological facts about race. A special section starts on page 6.

Photo: Three Lions

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★ ★ ★

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SCIENCE DIGEST is published monthly by Popular Mechanics Company.

RICHARD E. BERLIN, *President;* RICHARD E. DEEMS, *Vice-President;* FRED LEWIS, *Vice-President;* JOHN R. MILLER, *Vice-President;* JOSEPH F. KERN, *Vice-President;* FRANK MASSI, *Treasurer;* R. F. McCAULEY, *Secretary.*
Editorial and general offices at 959 Eighth Avenue, New York 19, N. Y. Subscription offices at 250 West 55th Street, New York 19, N. Y. ® 1963 by Popular Mechanics Company.

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Second-class postage paid at New York, N. Y., and at additional mailing offices. Registered as second-class mail at the post office, Mexico, D. F., Mexico, June 20, 1950. Authorized as second-class mail by Post Office Department, Ottawa, and for payment of postage in cash. *Science Digest* is indexed in *Reader's Guide to Periodical Literature*. Printed in the U.S.A. Unsolicited manuscripts must be accompanied by a self-addressed and stamped envelope.

### One-sided politics

I was very much disappointed with your article "The Facts About McNamara's 'Folly'" (July '63). I considered it a lowering of your consistently high standards when you mixed politics into a scientific magazine, and one-sided politics at that. The author, James H. Winchester, made a childish attempt to excuse the equally childish actions of McNamara himself.

In the article, Winchester stated, "The basic concept for both designs was the same." He goes on to say, in an excuse of McNamara's actions, that "the builder doesn't really matter." This is where Winchester is absolutely wrong, and this is where the title is also very misleading. Although some "facts" are presented, many important facts are entirely left out. One of the most prominent is the fact that Boeing underbid General Dynamics-Grumman by $100 million, and yet General Dynamics was given the contract.

In the editor's note in the article, it was stated that the General Dynamics design "might save some $1 billion during the lifetime of the craft." However, the author said that the two designs were basically the same. If so, how could General Dynamics' design save such a large sum?

The comments in this letter have been substantiated by Congressional investigations.

STEPHEN DERR
Spokane, Wash.

*McNamara said the General Dynamics design might save $1 billion, not Science Digest. In any event, our intent was precisely to get behind the politics surrounding the TFX to the plane itself, not to discuss who might build it better—a subject still under discussion in Congress as we go to press.*—EDITOR.

## Our cruel world

In "The Progress of Medicine" by Arthur J. Snider (July '63) you discussed Dr. Walter W. Sackett, Jr.'s method of adapting babies to frustration by giving them "small doses of frustration."

As a graduate student in the School of Education at the City College of New York, I can only say that Dr. Sackett's concept seems like something out of the dark ages. What he is implying is that we should be cruel to our children because eventually they will have to face the cruelty of the everyday world. I should imagine that a mother's obligation to her baby is to give him as much constructive love as possible in order to give the baby the strength to face a cruel and mechanistic world.

The medieval Dr. Sackett also fails to realize that the only way a baby can communicate his wishes is by crying. To ignore those attempts to communicate may be quite harmful to a baby's future development.

I agree with Dr. Sackett when he states that a child should not receive the toys, bicycles, dolls, etc., that the child wishes on simple demand. If a child is overly concerned with material things, perhaps the parent should look into the situation and try to find out why their child has these desires. Perhaps they may discover that the child is indirectly asking for his parents' love and approval.

LARRY SCHULTZ
Bronx, N. Y.

## Worked for Edison

I found your article on T. A. Edison (Aug. '63) very interesting. Especially so, in view of the fact that, in my early youth, I worked for a time in Edison's private lab. at West Orange, N.J.

EDWARD S. SCHULTZ
Buffalo, N.Y.

"Smile. . . . You're on 'Candid Camera.' "

## Where is thy sting?

In your quiz on insects (Aug. '63), one of your questions is misleading. You ask, "Which of these insects bites you? A. Female mosquito; B. Male mosquito; C. June bug." Your answer is A. Actually that is wrong because mosquitoes can't bite. They do not have biting mouth parts. Like all insects of the *Diptera* family, they have piercing mouth parts to aid in bloodsucking.

Of the three insects listed, the June bug is the only one that could possibly bite a person, since it is a beetle and has chewing mouth parts.

J. L. HOBSON
Rockdale, Texas

*Although we have never been chewed on by a June bug, we have indeed been bitten by mosquitoes. You are correct in pointing out that they have only piercing mouth parts, but Webster defines the verb to bite as "to seize with the teeth, jaws, or a jaw-like organ, so as to enter, nip or grip the thing seized; also to wound pierce, sting, etc., with a fang, a proboscis or similar organ." Now* there *is a sharp definition, we said cuttingly.*—EDITOR.

## A nice place to visit but . . .

While it is true that the "man-fish" described by Capt. J. Y. Cousteau (Aug. '63) would inherit the whole new world of the sea, he would be losing the infinitely more exciting worlds of discovery in space. (Capt. Cousteau described a man whose anatomy would be altered by surgery so he could live permanently beneath the ocean—ED.)

The sea may be a nice place to visit, but pity the man who must forever live beneath it.

E. HEDRICK
Ames, Iowa

## Scientific confirmation

I read your article "Gasolines: Is There Any Difference?" (July '63) with considerable interest. Intuitively I felt that the hogwash one listens to at many gas stations, about why one should use the higher-priced gasoline, is nothing more than salesmanship. Your article more or less scientifically confirms my own thinking.

MONROE H. BERG, D.C.
Far Rockaway, N.Y.

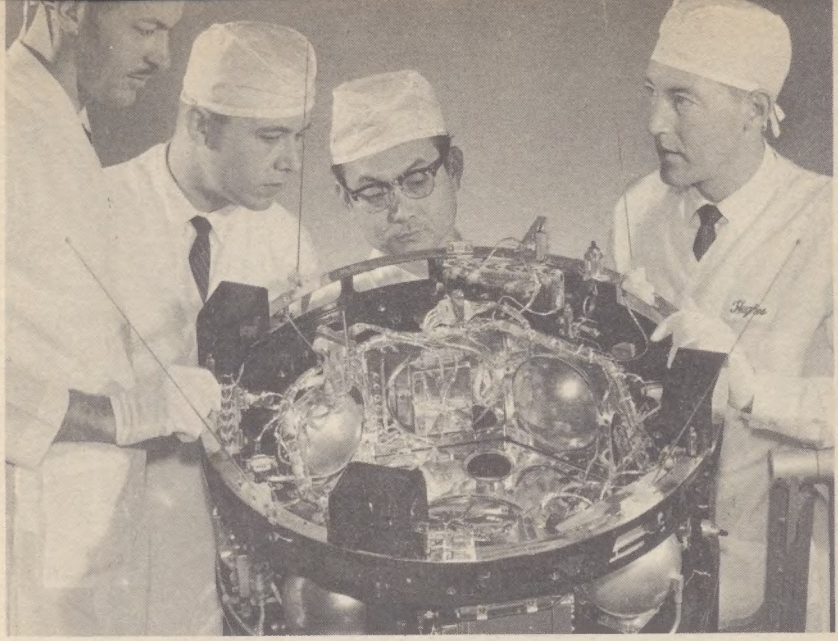
## Wonders of the sky

I have often wondered why someone hasn't listed a possible "seven wonders of the sky" so that they can be pointed out to people who say, "Once you have seen one star you've seen them all." Many people are confused by what they read about the sky or think of it as a confusing place and never look skyward.

Here is my list:

1. Galaxy of Andromeda: Only large distant galaxy seen with the naked eye.
2. Saturn: Looks like no other object in the sky with or without a telescope.
3. Stars that change in brightness: North Star, etc.
4. Pleiades: Only group of stars mentioned in the Bible.
5. Eclipse of the Sun.
6. Eclipse of the Moon.
7. Comets.

JOSEF OTOUPALIK, D.D.S.
Greely, Colo.



# SPACE DOCTORS

THE patient is only a machine—but what a machine!

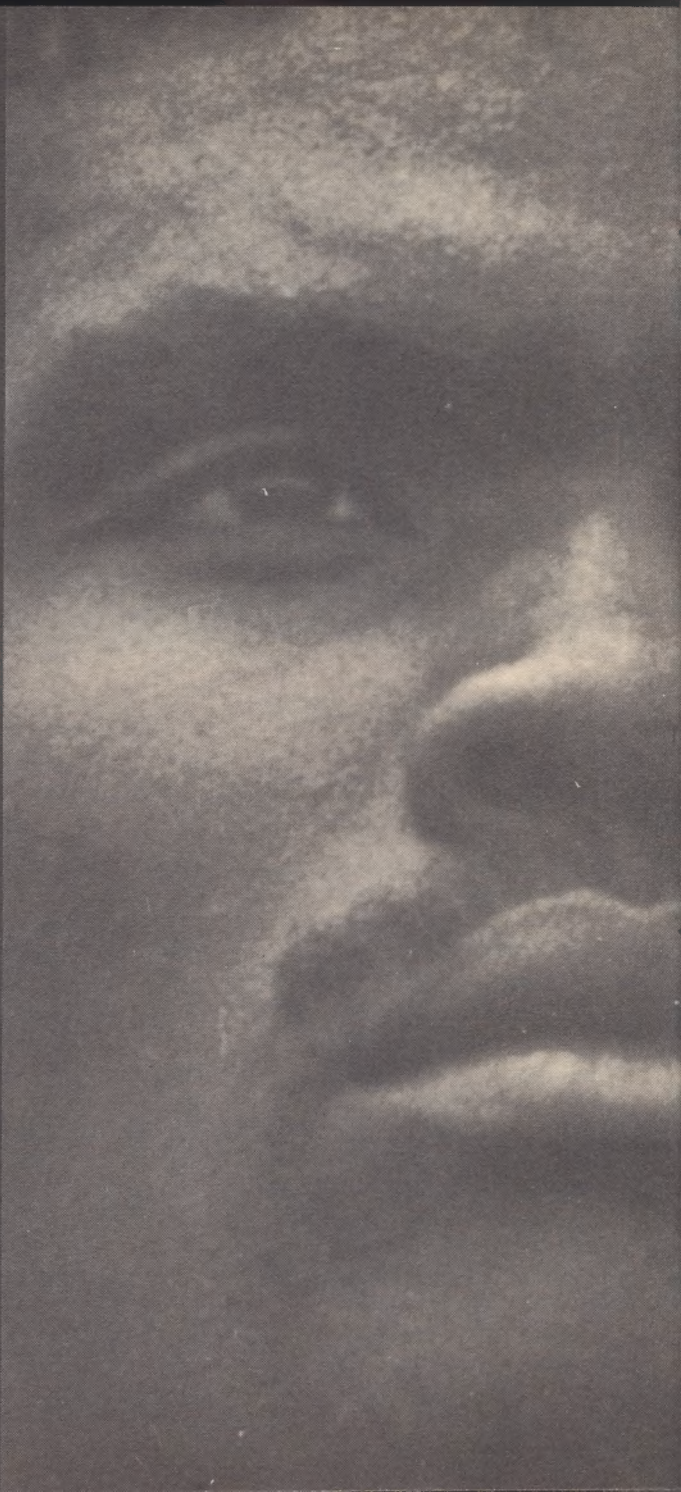
It's Syncom, perhaps the trickiest little satellite the U. S. has yet lofted into space. Because of its delicate precision, engineers had to assemble it with surgical care and cleanliness.

Syncom is different from other satellites because it is "parked" some 22,500 miles above the earth. This means that its orbit is nearly the same, both in direction and speed, as the rotation of the earth. It "hovers" above a given point on earth at all times and is in what is called a synchronous orbit, hence its name.

Syncom was shot up on July 26. When it was out in space, scientists on earth pushed the right buttons at the right time and fired a rocket motor in Syncom that pulled it out of the elliptical orbit into which most satellites go, and put it into a nearly circular orbit. When it started to drift, scientists fired gas jets to move it back.

Next, the spin of the complex machine was stabilized so that antennae on it pointed toward earth at all times.

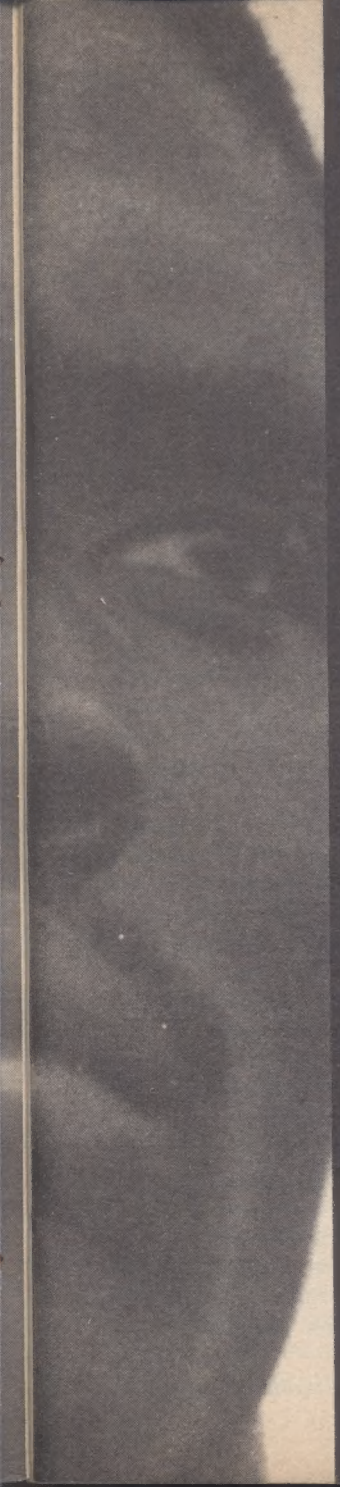
This satellite is an experimental one. It is hoped eventually to place three Syncom-type satellites in space—enough, because of their height, to support a worldwide communications hook-up.



# The Negro HOW HE'S DIFFERENT

By Andrew Hamilton

PIX photo



**The uproar over integration has drowned out the voice of one man to whom Americans nearly always eagerly listen–the scientist. In matters of space shots, atomic structure and cellular life, we are in awe of the scientist. In matters of human relations, the scientist is often forgotten. Yet the scientist is the man who perhaps can shed the most light in the emotional murk that clouds racial issues. *Science Digest* here gives him his say.**

FROM the viewpoint of science, just what is race? Are some races inherently superior? Are others doomed by nature to continuing inferiority?

"Misunderstanding over racial matters is usually due to two factors." So says a well-known anthropologist, Dr. Clement Meighan of the University of California, Los Angeles.

"First, the word 'race' is too loosely defined by most people. And second, many popular beliefs that date back 200 or 300 years are completely out of date in light of modern knowledge."

Science recognizes three great families of man—the Caucasoids, the Mongoloids and the Negroids. These are the so-called "white," "yellow" and "black" races. Of the world's 2,666,000,000 people, some 56 percent are Caucasoids, 34 percent are Mongoloids and 10 percent are Negroids.

The most important physical characteristics for determining race are:

*Skin color*—Caucasoids generally have whitish skin, but it may also range to olive or brown. Mongoloids are yellowish or copperybrown. Negroids are dark brown or black. But skin color is only one of several criteria that determine race. Caucasoid Hindus in the United States are sometimes mistaken for Negroes. And the Negroid bushman of South Africa is lighter than some East Indians who live in that country.

*Nose*—In most cases, Caucasoids have narrow, moderately high noses. Negroids have broad, flat noses. Somewhere in between are the Mongoloid noses.

*Hair*—Caucasoids have fine-textured hair, moderate in length, wavy or curly—ranging in color from blond to black. Mongoloids, such as Chinese and Japanese, have coarse, long, straight black hair. Negroids have hair that is coarse, black and kinky or curly. Caucasoids have considerable body hair, while Mongoloids and Negroids have almost none.

*Other features*—Form of the eyes, shape of the skull, protrusion of the jaw and stature are other yardsticks used by scientists to divide men into the three primary races. All these physical features are useful, but none alone is decisive.

"Anthropologists realize that dividing man into races is a difficult and not always exact science," says Dr. Meighan. "Nature is somewhat less systematic than anthropology, and there are a few odds and ends of *homo sapiens* that seem to defy classification."

## No clearcut lines

The Australian primitives do not fit neatly into the concept of the three great races. They have the wavy locks and abundant body hair of the Caucasoids, and the black skin and broad noses of the Negroids.

Anthropologists have also divided the three great races into a number of sub-races. The Caucasoids, for example, are divided into the Nordics, the Alpines, the Mediterraneans and several other minor groups.

The Nordics (Scandinavians) have light complexions, blue eyes and light hair. They are relatively tall, with long, narrow heads. Alpines (found in southern Germany and France) are short and stocky, and their heads are round. Mediterraneans (Spain, southern Italy and the Arab countries) are moderately short and slight in build, brunet in complexion, black-haired and with long, narrow heads like those of the Nordics.

Caucasoids originally predomi-

**According to some estimates, only 10 per cent of American Negroes are of pure-blooded stock.**

nated in Europe, North Africa, the Middle East and India. Negroids lived in the southern two-thirds of Africa and in Melanesia—which includes New Guinea and the Solomon Islands. Mongoloids covered eastern and south-eastern Asia, as well as North and South America. All the Indian tribes of the two Americas were Mongoloids.

In the last few hundred years, this picture has changed greatly. Australia is inhabited largely by Caucasoids. North and South America are populated by all three races —a wide variety of mixtures. Europe, of course, has a long history of blending among sub-racial groups.

Kaleidoscopic changes have taken place in the New World. In Brazil, the blood of Negro slaves has intermingled with that of the Caucasoid settlers and the Mongoloid natives almost to the point of disappearance. In the United States, there has been enough racial intermixture so that the average Negro is markedly different from the West African groups from which he originated. According to some estimates, pure-blooded stock among American Negroes is no more than 10 percent.

Each year a number of light-skinned Negroes "pass" into the Caucasoid race. Since such passing is done secretly, no reliable figures are available. But estimates from census returns and other data indicate that the number may be as large as 2,000 or 2,500.

"In a population of 180,000,000, this is not a large figure," says Dr. Meighan. "But it does illustrate the old anthropological maxim that when races meet, they *may* fight, but they *always* mix."

A parallel could be drawn in the case of the Mongoloid American Indian. Many Caucasoids are proud of a bit of Indian blood in their family tree—Will Rogers was one, Vice President Curtis another.

## A heritage of mixing

The longer a family has been in the United States, the more likely it is to have Indian blood. An eight-generation family dating back to Revolutionary days has 256 contributing ancestors, any one of which might have been Indian—or Negro.

Some have been quick to claim that because the Negro is dark he is closely related to the anthropoid apes—and is thus racially inferior. This argument assumes that as man developed evolutionally, the darker Negroids belonged to an earlier branch of the human family. According to this view, the lighter

Mongoloids are less ape-like than the Negroids while the Caucasoids are the least ape-like of all.

But this theory does not stand up against the facts. Anthropoid apes are characterized by long, narrow heads, protruding jaws, wide, flat noses, thin lips, short legs and a covering of moderately short hair all over the body. If the Negro were the most ape-like, he would match these characteristics more closely than people of any other race.

## Closest to the ape?

It is true that the Negro has a long, narrow head, a protruding jaw and a wide, flat nose. But there the resemblance ends. His large, full lips and his long legs make him the least ape-like. On the other hand, Caucasoid hair is similar to that of the apes and, like them, the Caucasoids have considerable body hair. Whatever you may think of hair on the chest—and most men are proud of it—it suggests that the Caucasoid bears a closer relationship to the apes than do the Negroids or the Mongoloids.

After comparing many anatomical features, anthropologists have decided that it is impossible to grade races in terms of the "highest" and the "lowest." All three resemble the anthropoids in some respect, but in others they do not.

It is sometimes claimed that the Caucasoids have larger brains and with more convolutions than those of the Negroids. But while the Caucasoid cranial cavity is generally somewhat larger, certain Negroid sub-races have larger brains than the Caucasoid average—and so do the Eskimos, the Japanese and the American Indians—and so did the primitive Neanderthal man.

Students of the brain have found no racial distinctions in the brain's convolutions. A famous physical anthropologist, Le Gros Clark, said flatly, "There is no microscopic or macroscopic difference by which it is possible for the anatomist to distinguish the brain in a single individual or different races."

There are those, however, who declare all such scientific determinations are beside the point. It is self-evident, they say, that primitive peoples are members of "inferior" races. They point out that even in the United States, the Negro who attains eminence as a leader of culture, science, industry or politics is the exception rather than the rule.

"But scientists don't rely entirely on the self-evident," says Dr. Meighan. "The cultural anthropologist has found much to indicate that achievement is more likely to depend upon opportunity than upon race."

A classical example is the study of intelligence levels of World War I draftees. While the tests were in the interest of Army classification rather than scientific enlightenment, results were of considerable interest to scientists. Anthropologists who have studied the statistics agree on several points:

1. That the general achievement

## Anthropologists say all three races resemble apes in some respects— in hairiness, Caucasoids most of all.

level of the Caucasoids was higher than that of Negroes.

2. That Negroes from Northern states scored higher than Negroes from Southern states.

3. That—and this was the most revealing of all—Negroes from certain Northern states scored higher than Caucasoids from certain Southern states. For example, Negro scores from Ohio, Illinois, New York and Pennsylvania were higher than Caucasoid scores from Arkansas, Kentucky and Mississippi.

"To the anthropologist, this means one thing," Dr. Meighan says. "Better educational opportunities of the North produced higher scores for people in that area regardless of race. It should also be remembered that educational opportunity is only one factor in potential achievement. Also important are such factors as economic opportunity and social acceptance. In this light, it may be remarkable that Negroes have achieved as much success in this country as they have."

A final approach to the tricky question of racial superiority is a consideration of what each race has contributed to the development of the world's civilization. At first glance, it would seem that today's predominantly Caucasoid Western civilization would win hands down.

"But it's not that simple," Dr. Meighan cautions. "True, during the past few hundred years the Western European-United States culture has been recognized as superior. But this span of time is but a moment in the world's history."

He points out that many former civilizations were non-Caucasoid or only part-Caucasoid. The ancient Egyptian civilization, for example, had strong strains of Negroid blood. The Mayas and the Aztec civilizations were Mongoloids.

### A pride in race

"It is natural to be proud of one's own people and to consider them to be the most beautiful and most interesting," says Dr. Meighan. "But it is a grave scientific mistake to underestimate the vitality and potential of other races.

"And, as is being demonstrated here in the United States in this year 1963, it is impractical as well as morally unjust to keep any race in the status of second-class citizens. Instead of trying to solve our racial problems on the basis of outmoded prejudices, we must view them through the eyes of science if we are to live up to our historic American tradition of justice for all."

# The Negro WHY WHITES FEAR HIM

by Selma Hirsh

The wave of Negro demonstrations sweeping the country has reflected the unspoken feelings between the races. Here Negro demonstrators in Birmingham, Ala., kneel to pray as a helmeted white policeman stands by.

*The hidden forces behind racial discrimination are never widely discussed. But they have recently become sharply clear to sociologists and psychologists who have studied the issue. This article is based on a monumental inquiry, sponsored by the American Jewish Committee, which led to a five-volume work published by Harper & Row,* Studies in Prejudice. *It is regarded today as a classic of its kind.*

ALL of us are plagued by fears. Where we differ from one another is in the extent to which they take possession of us, in the degree of our awareness of them, and in the strange things we do because of them.

Some people cling frantically to their prejudices to avoid facing their fears.

Scientists have examined not only the *attitudes* of the prejudiced but the crucial events and the critical experiences in their lives. They inquired into the way these people felt about themselves as well as about others, and how they felt about life generally. They probed into their memories, opinions, hopes, and fears. And in this way they discovered many things about the nature and the molding of the prejudiced personality.

Their findings, until recently known only to scholars, throw light on the cause and the course of the prevailing fear-fever.

Excerpted from *Fear and Prejudice*. Copyright © 1957 by The Public Affairs Committee, Inc.

The deepest fears of many white Americans are those surrounding their determination to "be good." They are caught in a constant conflict between their instincts and their reason. The stronger their "bad" impulses, the greater the wish to disown them—and the more difficult it is to do so.

One way to make it appear that one is rid of these impulses is to censure them in others—and in fact, in the very act of doing so, one is often helped to curb them in oneself. For example, to call another dirty is to make ourselves—as well as others—conscious of our cleanliness. To call another lazy is to suggest that we are diligent. If those we accuse look as different from us as possible, our accusations sound all the more convincing. For if one *looks* different, then is it not to be assumed that one also *acts* differently? "If *he* possesses such unconscionable traits, then I who am so different from him, most assuredly do *not*!"

Those in search of such a foil would hardly overlook the Negro, for he is qualified on two counts: his difference and his darkness. The Negro is black in a culture that associates blackness with evil, and whiteness with purity and goodness. "Dirty black" is so commonly run together that it requires almost a special learning process to separate one word from the other. This is true as well of "light and bright," "dark and dreary," and countless other expressions.

In a special study of white, Anglo-Saxon veterans (to discover whether their war experiences had affected their feelings about minorities) more than half were frankly hostile toward Negroes, and their explanations for this were nearly always riveted to the Negroes' alleged immorality. They would take the interviewer the breadth of the globe—far beyond their own experience—to prove how insatiable were the Negroes' physical appetites.

Evidence to refute their contentions would be steadfastly rejected. When the interviewer introduced records of outstanding bravery and exceptional fighting on the part of Negroes, these would be dubbed by the prejudiced as "out-and-out propaganda"; or it was asserted that "the few good fighters were the exceptions" and that there were "damned few, at that"; or the Negroes' ability to kill the enemy was seen as consummate proof of "the innate murderer in every last one of them."

Of 150 middle-class veterans (all previously enlisted men) more than 80 percent admitted, however re-

**Fear of "bad" impulses leads many whites to censure them in others. The Negro is different and dark and handy.**

## "Social equality," say the prejudiced, "will cause intermarriage." They mean: "Intermarriage will bring equality."

luctantly, that Negroes had their "rights."

When the contemplated equality moved into the more personal areas, however, the statistics all but collapsed. Only one out of ten was willing to live next door to a Negro (although eight out of ten would live next door to a member of a white minority group); and nine out of ten emphatically disapproved of Negroes and whites "mixing together socially."

Whenever white-skinned minorities were discussed, it was generally conceded, however grudgingly, that eventually they would become an indistinguishable part of the majority. It was often suggested that members of these groups ought to shed their "different customs," that they ought to learn to dress, to act, and to behave "like everybody else" —the implication being that the sooner they did this, the sooner would their assimilation be achieved.

No such eventuality was admitted where the Negro was concerned. In fact, the fear of it provided the ultimate argument in favor of restricting the Negro's mobility and hence his equality.

Those who were opposed to any and all forms of social equality, including integrated housing, appeared to have no difficulty in reconciling their views with their understanding of democracy. "After all," they would declare, "we're not depriving them of anything but the right to mingle with us—and who, after all, wants his sister to marry a Negro?"

In his widely heralded book, *The American Dilemma* (see review, which follows), Gunnar Myrdal concludes that "we cannot avoid observing that *what white people really want is to keep the Negroes in a lower status,*" and the arguments against social equality are but rationalizations to achieve this. They may *say*, "no social equality because this will cause intermarriage." They will *mean*, "no intermarriage because this will bring about equality."

There are then, many reasons for the suppression of the Negro that were not apparent in the explanations given by the prejudiced. The reasons reside in the white men and in American society itself; but the explanations were uniformly affixed to the Negro.

It was explained by the prejudiced, for example, that Negroes were "child-like"; that as they shared none of the restraints of decent people, neither did they share their social or economic ambitions. Negroes, it was claimed, are happy the "way they are."

It was said that the Negroes are dirty and take no pride in their appearance; that they are innately stupid—fit for nothing but the most menial tasks. It was maintained that Negroes have "no sense of values," that they lack "self-respect," that they are hapless and planless. Even such virtues as the Negro was alleged to possess—his love of children, his enjoyment of the "simple pleasures," the "animal-like" devotion of which he was presumed to be capable—these were used to support, never to challenge, what was implicit, namely, that for the Negro, slavery is a perfect vocation.

In the more extensive interviews, however, the arguments often shifted. Where before the Negro was contemptible because of his weakness, now he was insufferable because of his arrogance. Where before he was hopelessly stupid, now he was dangerous when he is educated, for then "nothing is good enough for him." Where before the Negro was without ambition and eminently content with his lot, now it was argued that "he wants nothing more than to be where the whites are." "Give him a finger and he'll take a hand." "Give him a job with whites and the first thing you know the colored are taking over and the whites are out on the street."

At the heart of all these arguments is the conviction that the status of the Negro *must not be improved*. Once the Negro is permitted to leave his "place," the prejudiced white man can no longer be certain of his own position; for such a person finds his place only by keeping others in theirs, and he proves himself only by declaring his superiority.

Only as long as the Negro is nobody, can he, the prejudiced, be somebody.

When the highly prejudiced and those low in prejudice talked about the Negro, they did not differ greatly in their description of his present condition. They moved apart sharply, however, in their explanations for it. When those low in prejudice looked at the Negro, they perceived the effect of discrimination. When the highly prejudiced observed him, they saw only conclusive proof of his inferiority.

This type of selective vision serves the highly prejudiced well. He sees only sinners and savages, and one is expected to bar *them* from the company of the civilized and virtuous. If one sees victims and suffering, one is expected to help. But the highly prejudiced person cannot really help anyone until he has a deeper understanding of himself. For if he could have reduced his own torment, he would very probably not now be finding it necessary to torment others.

Thus it is that the fear that induced the white man's prejudice grows because of it. The added fear strengthens the prejudice; the prejudice reinforces the restrictions; the restrictions increase the resentment of the Negro and multiply the guilt of the white man. The chain is now complete. It shackles equally all who helped to forge it.

# The book that started it all

How far should integration go? Should it stop short of intermarriage? Will it?

The fundamental dynamics of white feelings toward Negroes, and vice versa, revolve in the end around these questions. For all the considerations of justice and brotherhood and democracy, there is one matter we must all understand: What makes whites and Negroes think and feel as they do about each other?

A book first published in 1942 undertook a systematic, no-holds-barred inquiry into the matter. So far-reaching and penetrating was it that it has since gone through 26 printings—the latest a twentieth-anniversary edition that appeared not long ago with a review of recent developments which showed how true its findings remain.

The book is *An American Dilemma,* by Gunnar Myrdal (Harper & Row, New York and Evanston, $16.50). Over the years, it has been perhaps the principal spur in the scrutiny of the "Negro problem" by the social sciences. The author, a Swedish social economist who knows us as well as we know ourselves (probably better), analyzes the "dilemma" across the board. His work is divided into parts with headings that range from "Race" and "Politics" to "Justice" and "Social Stratification."

Yet throughout the book's 1,483 pages, one theme recurs: the reasons why white Americans generally prohibit, avoid or feel uneasy about social equality with Negro Americans.

The reasons begin to become apparent when whites are asked to rank various types of discrimination in order of importance. No. 1 is "the ban on intermarriage and other sex relations involving white women and colored men." It takes precedence, says Myrdal, over everything else.

"It is the end for which the other restrictions are arranged as means. Thereafter follow: (2) all sorts of taboos and etiquettes in personal contacts; (3) segregation in schools and churches; (4) segregation in hotels, restaurants, and theaters, and other public places where people meet socially; (5) segregation in public conveyances; (6) discrimination in public services; and, finally, inequality in (7) politics, (8) justice and (9) breadwinning and relief."

But ask Negroes the order in

## To whites, the "marriage matter" takes precedence over everything else. To Negroes, it "is of rather distant and doubtful interest."

which *they* rank types of discrimination and it *"is just about parallel, but inverse, to that of the white man."* Says Myrdal:

"The Negro resists least the discrimination on the ranks placed highest in the white man's evaluation and resents most any discrimination on the lowest level. . . . Negroes are in desperate need of jobs and bread, even more so than of justice in the courts, and of the vote. . . . The marriage matter, finally, is of rather distant and doubtful interest."

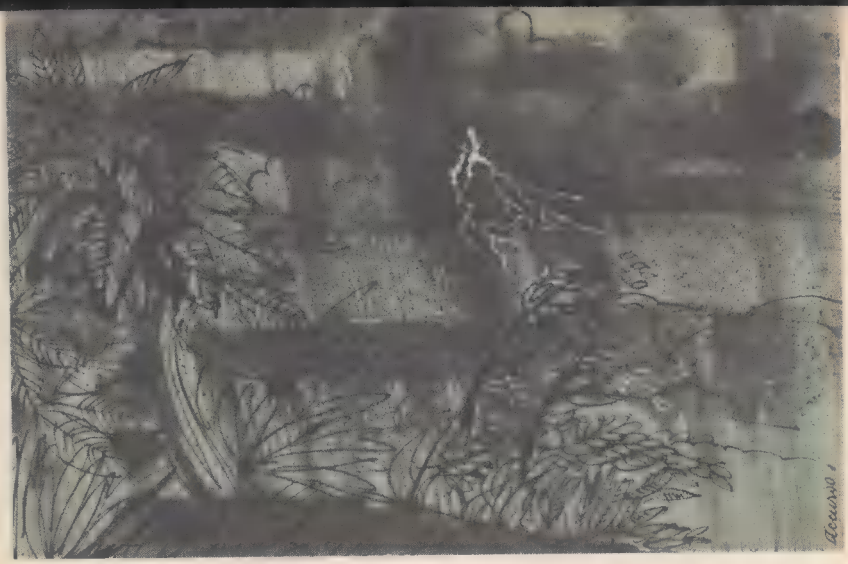
Why do whites put the fear of intermarriage at the top of the heap? Do they really mean it? Or is there an undefined but even more potent motivation behind that fear?

Certainly sexual considerations cannot be disregarded. "The belief that practically all Negro women lack virtue and sexual morals," says Myrdal, "bolsters up a collective bad conscience for the many generations of miscegenation. At the same time, it is, occasionally, a wishful expression of sexual appetite on the part of white men. The belief in the strong sexual urge . . . of Negro women (the 'tigress' myth) has more obviously this latter function." The belief in the sexual superiority of Negro males "is to be taken as an expression of a similar sexual envy and, at the same time, as part of the social control devices to aid in preventing intercourse between Negro males and white females."

But the story does not end there, "The great majority of non-liberal white Southerners utilize the dread of 'intermarriage' and the theory of 'no social equality' to justify discriminations which have quite other and wider goals than the purity of the white race. Things are defended in the South as means of preserving racial purity which cannot possibly be defended in this way.

"To this extent we cannot avoid observing that *what white people really want is to keep the Negroes in a lower status."*

Myrdal's findings, though published for over 20 years, have reached an audience among only a handful of Americans compared with the millions who sound off on race relations. But the book's influence, hopefully, will be wide, for it helps us understand, and with understanding, America's racial revolution may yet prove our maturity as a people.—*H.P.*



# Life under 150 inches of rain

by Aileen Vincent Barwood

**The wife of a U.S. educational aide in the tropical rain forest of West Africa reports on her battle against shoes that grow furry overnight and adders in her washing machine.**

ADAPTING to life in the tropical bush of West Africa provides some exciting moments, occasional despair, and a few unexpected rewards. It requires a constant struggle to overcome the loneliness, the discomforts, and a climate which even ten years ago was referred to as "the white man's grave."

Designated as "tropical rain forest" on the maps, this bulge on Africa's west hip receives an average of 150 inches of rain a year, as compared to New York's 42-inch average or New Orleans' 63½ inches. And the annual rainfall here seldom, if ever, varies more than 10 percent from the average.

From mid-June through September, metals corrode, clothes mildew, and shoes grow furry overnight. Washing is dried in the oven, or by prolonged ironing, a wearisome task where sheets are involved. Cameras, binoculars, and all precision instruments must be kept in special airtight cases with a bag of silica-gel. Light bulbs burn night and day in

closets to help dry them out. Books, leather goods, and records are taken out and wiped off daily since even two days' neglect can produce a coating of green.

Yet despite these inconveniences you find yourself looking forward to the coming of the rains as a welcome relief from the bludgeoning heat of April and May. Daytime temperatures drop to 80° with a cool low of 72° at night during the rainy season, making sleep under the oppressive mosquito nets somewhat more restful.

## Violent seasonal storms

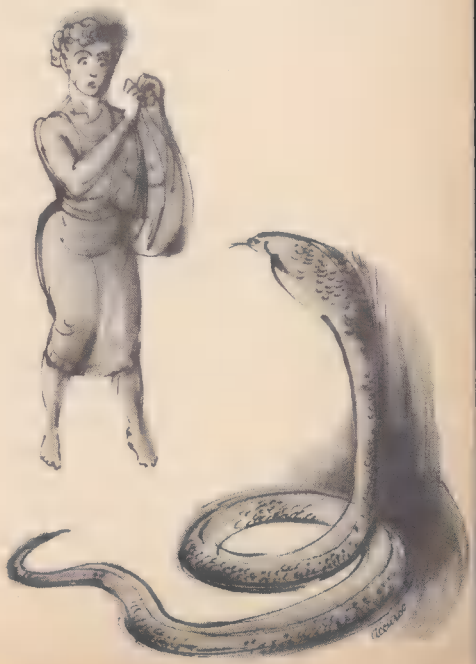
While thunderstorms may occur during any month of the year, the beginning and end of the rainy season are particularly marked by severe electrical storms. Sometimes referred to as tornadoes, these tropical storms have to be experienced to be believed.

First comes an eerie stillness when not a leaf stirs and all bird and insect voices are hushed. Then the high winds rush in, lashing trees, snapping off branches, ripping off thatch roofs, or smashing back unfastened doors and windows. Finally the rain, large drops falling slowly at first, then faster and thicker until there is a Niagara of water falling too fast for the earth to swallow.

The sky is torn apart by great ragged forks of lightning, trees are uprooted or whipped to and fro, thunder crashes, one peal following another. Inevitably the lights go out. In a recent storm one friend lost the heavy wooden door of his bungalow; another the corrugated metal roof off his kitchen.

During this season, the insect population explodes. The frogs and lizards which eat them serve a useful purpose but are present in such numbers that they too become household pests. The full-throated chorus of thousands of frogs around the house has often sent us to bed with cotton plugging our ears. Crickets, cockroaches big as field mice, scorpions, spiders thin as paper, praying mantises six inches long, and fat beetles require daily battle with a spray gun. At night,

The wife of a British official had to do battle with a six-foot, spitting cobra at an embarrassing moment.



reading outside the mosquito net is impossible because of the hundreds of winged creatures which flutter and spin around the lights.

Of them all, the anopheles mosquito is the most dangerous. Malaria is still the single greatest debilitative disease in tropical Africa; carried by the female of the species, it can be warded off only by regular doses of malaria suppressives. Insect bombs are a part of daily life and mosquito nets are as standard a piece of equipment as toothbrushes.

## Nesting in strange places

A constant nuisance is the mud-dauber wasp which builds its mud nest in such secluded places as behind curtains, under chairs, in back of books in a bookcase, or—in one instance—in the toe of a shoe. The tiny tubla fly lays its eggs on clothes drying on the line; then, unless the clothes are ironed on both sides with a hot iron, the eggs hatch and the larva burrow into the wearer's skin, to raise an itching red lump. Treatment consists of applying grease to the lump and when the worm comes out for air, nipping off its head with tweezers.

Snakes are probably the biggest worry. As in most tropical countries, they abound. Early European residents soon learned to build their houses on three-foot stone pillars; the more modern, ranch-style homes, such as we live in, are on the level, presenting a constant danger of snakes. Our count to date has been one night adder in the washing machine, a three-foot leaf snake (harmless) in the kitchen, which is separate from the house, and a baby cobra, encountered in the middle of the living room floor, which was quickly despatched by a blow with a tennis racket.

Not so fortunate was the wife of a British official. While standing by her bed dressing, she heard a rustling behind her, turned, and encountered a six-foot spitting cobra —hood out, read to strike. It spat, hitting her petticoat, before she grabbed up the baby from the bed and ran out; the snake, meanwhile, slithered back behind the massive false - bottomed wardrobe from whence it had come. She returned with the gardener who coaxed the snake out; then she chopped off its head with a machete.

Standard equipment for life in the bush includes snake-bite kits, heavy shoes (worn also as a protection against chiggers) and strong nerves.

By mid-October, when the *harmattan*, or monsoon winds, start blowing, the land begins to dry out. Days are clear and sparkling. The Africans, however, dislike this time of year, complaining that the winds are too drying.

This is the season African men choose to disappear into the bush to perform the initiation rites of their secret society. To the accompaniment of loud chants, tinkling bottles, rattling tin cans, and all-night dancing marathons, the new crop of young boys become members in secret ceremonies which some-

times last for a week. Now our nights are punctuated by the disturbing drums which go on without let-up until dawn—disturbing because of their elemental heart-beat rhythm which eventually catches you up in its pounding until it is difficult to separate heart beat from drum beat.

But there are, as well, rewarding aspects of life in the bush. Butterflies brilliant as Christmas tree ornaments decorate our garden. Monkeys play in the generous trees beside our house, and colorful birds flash and wheel among the leaves. One favorite, the beautiful Senegal Roller, has turquoise wings and breast, a burnished copper back, and long turquoise tail scalloped with deep purple. Sunbirds, yellow wagtails, palm swifts, shrikes, weavers, bee-eaters, doves, kites, and tiny yellow-green parakeets are frequent visitors. Bush fowl and pheasant are plentiful and provide good hunting.

A steady hand with a spray gun is one prerequisite for life in the tropics, where cockroaches come as big as field mice.

Another pleasure are the tropical plants with their extravagant foliage and exotic blooms. Hibiscus, scarlet and purple bougainvillea, poinsettia, orchid trees, oleander, mimosa, and the dazzling flame trees grow in profusion—as does everything. Radish seedlings put in on a Sunday morning were up an inch and a half by Tuesday morning. In the moist greenhouse atmosphere new trees grow eight feet in a year, roses thrive, and two crops a year from the same tree are common. Fruits such as mangoes, pineapples, paw paw, bananas, avocados, coco nuts, citrus fruits, and others, are plentiful and cheap the year round.

Shaking cockroaches out of your clothes and dust out of your hair, boiling all drinking water and soaking all vegetables in disinfectant, and teaching your children at home by correspondence system can leave you feeling the discomfort isn't worth it.

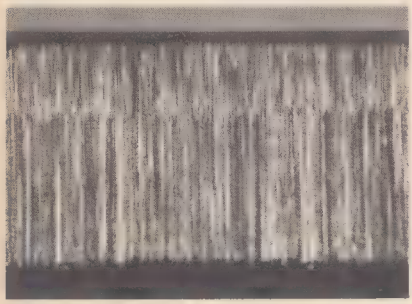
On the other hand, African villagers are friendly and warm-hearted people, fond of a joke, and refreshingly forthright. Going 'on trek' reveals hidden river valleys where monkeys cavort and colonies of yellow butterflies flutter up in clouds, pools where crocodiles lie up, marshes where hippos live and elephants come to drink, and cool green bamboo forests alive with smaller animals.

As one old Africa hand, veteran of twenty years on the coast, put it: "Aren't many places left any more where you c'n get the feeling of pioneerin'."

# What happens when you shave

Men, this is not a piece of sandpaper—it is what the side of your face looks like, close up, before your morning shave.

by James H. Winchester



The ultimate edge of a razor blade, magnified about 100 times. Black band at top is produced by final honing (Gillette photo).

**From sharks' teeth to stainless steel—that's the history of shaving. But no matter what method you use, here is how to get rid of that unwanted hair most effectively and comfortably.**

THE new stainless steel safety razor blades are creating a new lather in the age-old business of shaving. These blades first became popular a year ago when they were marketed by a British company. They offer anywhere from 18 to 30 smoother shaves per blade. To meet the competition, major U.S. blade manufacturers have rushed in with stainless steel products of their own.

But is a better blade enough to take the scratch out of a chore now endured by both men and women?

Certainly, the cutting edge is the most important element, whether you're using a straight razor, a safety razor or an electric model.

The safety razor differs basically only from the centuries-old straight blade razor in that it is easier to handle, doesn't have to be honed or stropped to be sharpened, is safer and less expensive. Straight razors do not give better shaves. A razor, after all, is only a sharp edge, and everything back of that edge is just a support for that cutting surface. The cutting blades in an electric razor work on the same principle, but they are so finely adjusted that they can cut whiskers dry, eliminating the bother of applying

*(Text continued on page 24)*

## What about those stainless steel blades?

Behind the new stainless steel blades is a long scientific search for longer-lasting, keener blades, involving improved metals, and entirely new grinding, tempering and honing techniques.

To develop its own double edge stainless steel blades, the American Safety Razor Company, for example, turned to its experience in manufacturing stainless steel surgical blades, and also called in the research staffs of Virginia Polytechnic Institute and the Stevens Institute of Technology to work with its own scientists.

It's long been known, of course, that stainless steel, with its anti-corrosive properties, plus its strength, is highly resistant to blade deterioration caused by the corrosive effects of soaps and natural oils, and is superior to carbon steel. Stainless steel, however, reacts differently from carbon steel in the close tolerances necessary to razor blade manufacture. Ordinary stainless steel, such as is used in kitchen knives, is extremely tarnish resistant, but much too soft for blade edges.

"The first thing we had to do," says Dr. Lee S. Harrow, American Safety's Razor's head of Research and Development, "was to design and build a new-type 'furnace' for tempering stainless steel for high precision grinding and honing. For instance, the chromium content of stainless steel, which is responsible for its resistance to corrosion, at the same time affects the metallurgical structure, thus making it more difficult to grind on conventional equipment."

New high-tolerance sharpening machines, with a degree of control and precision never before realized for mass manufacturing, were developed. That meant the total redesigning of spindles which are central to the honing tools, and the development of new self-dressing, or cleaning, wheels. The result is a production-line sharpening tool whose infeed tolerances alone are less than 25 millionths of an inch.

Stainless steel blades are nothing new. They have been on the market in England, and on a small scale in the United States, for the past 30 years. Generally, though, they did not become popular until just recently because they did not provide enough shaving comfort. The best of them, even using high quality Swedish steels, were inferior to ordinary steel blades.

The Gillette Safety Razor Co.'s researchers, for instance, found that razor blade edges deteriorate as much from microscopic edge corrosion as from mechanical dulling during shaving. Their answer, in addition to improved hardening and sharpening techniques for stainless steel, is a new coating material, which is applied thinly over the keen cutting edge of the blade.

creams. Women, incidentally, are among today's biggest users of electric razors.

But whatever type razor or blade you're using, it'll pay you to know the fundamentals of good shaving practices. After all, a man in the course of his adult years spends over 3,500 hours, or nearly 150 days, removing hairs from his face.

First of all, your whiskers, which are about four times as thick as the hair on your head—and the average man has about 30,000 of them on his face—are as tough as copper wire of the same size. Beneath the nose and on the chin they may be as dense as 700 or 800 to the square inch. Increasing in coarseness from the top of the head to the tip of the chin, man's whiskers come in many varied shapes—oval, round, rectangular. Left uncut, they grow about .17 inch per day, or half-an-inch a month. Incidentally, there is no foundation to the belief that dark beards grow faster. They merely show up sooner against the light tint of the skin.

Enlarged photo of day-old whiskers collected in a shaving study. These are about 5/1000's of an inch in diameter.

To whisk 'em off comfortably, they have to be softened. Chemically, whiskers are formed of Keratin, which is composed of nitrogen and sulphur. About the only thing that will soften them, making them easier to cut, is plain water. Warm water dilates hair about 34 percent in volume, making it softer. Shaving creams only keep the beard soft by providing a protective covering which prevents the water from evaporating. They also allow the razor's edge to glide more smoothly over the skin. Some creams contain antiseptics to reduce skin bacteria, and others, with menthol, leave the face feeling cool. But they *do not* soften the beard.

All three types of shaving creams —lather, brushless and foam—work equally well. It's what you do before you use them that is important. Before applying any creams, the face should be thoroughly washed with soap. If you live in a hard-water area, use a bit more soap. Then wash off the first soaping and repeat the process. This rinsing has the effect of removing the oily coating present on all hair, and also removes grit which can dull even the new stainless steel blades.

These water washings, says the Mellon Institute in Pittsburgh, which has conducted extensive shaving tests, should take about three minutes. This gives the beard time to absorb the water. Rushing the

## Does shaving make your hair grow faster?

Shaving has no permanent effect on the rate of hair growth, says Dr. Howard T. Behrman. Writing in the Journal of the American Medical Assn., Dr. Behrman notes that although there is an immediate increase in the rate of hair growth after shaving, this increase is followed by a decrease within the next few hours. The net effect of a shave on the rate of growth, therefore, is zero.

Dr. Behrman also says cutting or shaving the hair does not make it darker or coarser. However, a hair shaft is darker and coarser at the root than at the tip, and cutting it near the root makes the hair appear darker and coarser.

process only prevents the beard from softening. If your beard is gray or white, this softening process should take longer. Such hairs, because of their chemical make-up, are almost twice as hard as dark whiskers. The water should be hot, about 115°F, for the best results. A shaving brush is better than your fingers for rubbing in the hot water and soap, making a faster, more even spread. Shaving creams should be applied only after such thorough soaking.

Wet the razor with hot water before starting to shave. Both the razor and the face should be kept wet during the entire operation. While shaving, bring the razor's edge down *with* the grain of the facial hairs the first time over. No whiskers, incidentally, except for a few at the edge of the chin, stand straight out. Most lean at an angle of 39 to 59 degrees. Under the chin they lie flat. If it becomes necessary to go over the beard a second time, lather the face thoroughly again, then shave *against* the grain.

Shave the cheeks and sideburns first. The thicker hairs on the upper lip and chin will then have more time in which to absorb a greater quantity of water and will be softer, therefore easier to cut when you get around to them.

All of these suggestions, incidentally, apply also to women for leg and underarm shaving, except that their finer hair needs less time for softening. Usually, for the ladies, a minute or minute-and-a-half is ample time to allow the soap and water to settle in before applying shaving creams.

The way you hold your razor is important. A slanting or slicing stroke requires less work, and is a decided advantage over using a direct or straight stroke.

To get the most out of any type blade, flush it with hot water while in the razor after using it, making sure that all hair and shaving cream is washed away. Do *not* remove the blade and wipe it. That only damages its finely honed edge.

## The rise and fall of the beard

The conquest of the beard dates back at least 60,000 years. Cave drawings depict some early men as being clean shaven. They probably used clam shells or sharpened shark's teeth for their razors. Egyptian civilization gave the art a boost. A bronze razor was removed from King Tut's tomb, still sharp enough for use. Nearly 5,000 years ago, the men of Mesopotamia scraped their faces with a blade fashioned from volcanic glass. Soldiers of the Roman Legion, in later years, to prove their heroism, scraped their beards off with pumice.

As early as the 4th Century, B.C. Alexander the Great and other military leaders made their troops shave, not for health reasons but rather because they found that beards offered enemy troops a convenient "hand-hold."

The first professional barbers appeared in Greece about 400 B.C. Rome's first barber was a man from Sicily, an island that supplies an abundance of barbers even today.

From about the Third Century B.C., when Scipio Africanus, famed conqueror of Hannibal, ordered all Roman men to shave daily, until the middle of the 13th Century, faces without whiskers were popular. There followed a period to about the beginning of the 17th Century when the beard was in full flower. In England, for instance, men wasted hours perfuming or starching their beards and curling them with irons.

It was Louis XIII of France, largely because he was unable to grow a beard himself, who, in 1610, ordered his subjects to shave daily. When Philip V took the throne in Spain in 1700 he issued a similar order. Enamored of Western customs, Peter the Great of Russia fined nobles with beards 100 rubles, those of lesser birth 100 kopeks. Good Queen Anne of England ordered her army and navy to remove their beards too. It was these troops—along with the Puritans, who cited the Bible as their reason to remain closely clipped—who brought the fresh-shave notion to this side of the Atlantic. George Washington had a fine set of straight razors and shaved daily. But with the start of the 19th Century, beards bounded back. Perry and Decatur, the naval heroes of the War of 1812, both had long, free-flowing whiskers. Civil War generals from both the North and South sported luxuriant growths on their chins.

Such hairy foliage remained popular until World War I, when safety razors—actually invented in 1903 by a traveling salesman named King C. Gillette—were issued to all U.S. troops, along with orders to shave daily. This wartime directive became a habit and beards have never staged any kind of real come-back.

Most blade sharpeners, say the experts, are just a waste of money. They can't improve on what the blade manufacturers have already built into their blades, and actually may harm the cutting edge. After the razor and blade have been thoroughly washed—but *not* dried—it should be stored in an open place, blade up. Incidentally, never store your razor in a medicine cabinet containing loose-stoppered iodine bottles. The escaping fumes will rust any type of blade edge.

Because they save time and eliminate the bother of soap, water and shaving creams, electric razors—or the "dry" method of shaving—are popular with many. In fact, about $125 million is spent each year in the United States for electric shavers. A blade, however, gives a much closer shave than any electric razor, although a safety razor takes off 4 to 15 times as much skin as an electric model, no matter how careful you are. This is not necessarily harmful, however. As Herbert Mescon, M.D., professor and chairman of the Department of Dermatology, Boston University School of Medicine, reported two years ago:

"All shaving—dry or wet—is accompanied by a form of abrasion. The skin is not a solid mass, but a structure composed of many layers. The outer layer consists of several rows of cells piled one upon another. The outermost cells, which die and become toughened to protect the delicate cells underneath, form the rough layer of the skin you feel when you rub your fingers over your face. As skin grows, the cells in this outer layer are shed, making way for new cells pushing their way up from below. Shaving removes layers of both these dead and living cells."

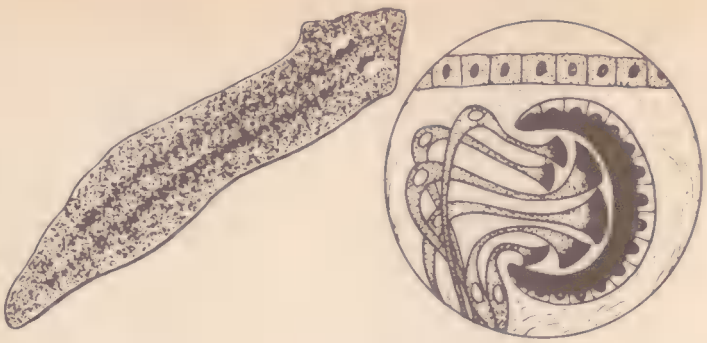
Another dermatology expert adds: "The remarkable thing is that shaving doesn't do more damage. The scraping away of the old tissues may stimulate the growth of new skin, and actually be beneficial. The normal face never shows any wear from daily shaves. In fact, a stone subjected to the same amount of scraping for 30 or 40 years, would probably show much more wear."

★ ★ ★ ★

### *Power under the earth*

Long before modern steam heating, the Maori tribesmen of New Zealand were heating their homes, cooking and bathing with water and steam from natural hot springs. Following the lead of these primitive tribesmen, the New Zealand government built a generating plant powered by underground steam.

Several such plants are planned for the U. S., Mexico, Central America, Italy and Iceland. One plant at the Geysers in California already supplies 20,000 persons with electricity, and the Interior Department would like to see more. It has recommended to Congress that it allow the use of geothermal steam on public lands for generating power.



A greatly enlarged drawing of a planarian or flatworm, and cross section of an eye spot. (From Man and the Living World).

# Our scientific blind spot

THE world looks different through different eyes.

The earthworm sees neither colors nor shapes. His eyes are single sensory cells buried in his skin. He only knows whether it is dark or light. If it is light, he creeps until he reaches darkness.

To the flatworm, who lives in brooks and ponds, the world is a little more complicated. His two eyes are cups lined with light-sensitive cells. Black pigment screens one side of the cups, so for the flatworm light has direction.

In the mollusk Nautilus, the rim of the cup is pinched together, leaving only a tiny hole. As in a pinhole camera, this small opening focuses an image inside.

Such a small hole doesn't let in much light, but if it were bigger, the image would be fuzzy. So Nature invented the lens in other species and put it in a wide opening, as in the human eye. The image we see is both bright and sharp.

Bees, with their thousands of tiny eyes, can see more than man in some ways. When clouds hide the sun, their navigation beacon, they can locate it by reading the plane of light polarization in patches of blue sky.

Although they are blind to red, bees can see ultraviolet, to which we are blind. Hardly any flowers that depend on bees for pollination are red. The few exceptions also reflect blue or ultraviolet.

Senses are just one part of the story of life Karl von Frisch, the man who decoded the language of bees, describes in his book, *Man and the Living World* (Harcourt, Brace & World, New York City. 304 pp. $7.50). He begins with the question—What is life?—but he can't really answer it. As of now no one can, for it is still one of our blindspots. Instead, he surrounds the question with a summary of all we know about life, from viruses to man.—*B. H. F.*

Photos by Bruce H. Frisch

The proposed one-million-kilowatt Ravenswood nuclear power plant may sit on this site less than two miles from the midtown Manhattan skyline at right.

# The 'A-Bomb' on New York's doorstep

by Bruce H. Frisch

**A battle is now raging over whether or not an atomic power reactor should be built in New York City. The outcome will set the pattern for atomic plants in other cities.**

IF THE Atomic Energy Commission gives its OK, the biggest nuclear power reactor in the world will be in operation two miles from New York City's Times Square by 1970. On a working day, 5.5 million people will be within a five-mile radius of the reactor.

How safe will they be?

The issue has been debated since last December 10, when the Consolidated Edison Company requested permission from the AEC to build a one-million kilowatt plant in the Ravenswood section of the Borough of Queens. The site is just one-half mile across the East River from Manhattan's posh East Side.

## "The chance for a serious accident does exist. The possible consequences of an accident are very large."

The plan drew a jolting reaction from David E. Lilienthal, former chairman of the AEC: "I would not dream of living in the Borough of Queens if there were a large atomic power plant in that region."

Others, equally qualified to speak, have recognized the dangers but insisted that the extraordinary precautions proposed should remove people's fears.

Who is right? Is the plant a potential "A-bomb," as some have described it?

Much depends on the answers—if the New York atomic reactor is approved, it will probably be only the first of many to be built in other large cities.

Serious critics knew from the start that a reactor is not built like an A-bomb and can't explode like one. But they felt strongly about other dangers:

"Although an uncontrolled chain reaction would cause a relatively small explosion," critics argue, "it could loose to the winds the enormous amounts of radioactivity sealed in the reactor. Even if we are lucky enough to avoid accidents, long exposure to the low-level radioactivity continuously discharged by the plant will cause a rise in the level of leukemia and birth deformities. Added to this, high-level radioactive wastes and spent fuel will move through the city on the way to dumping grounds and reprocessing plants. A mishap, then, could spread concentrated radioactive poison.

"Besides, for all the risks we'll take, our electricity won't be any cheaper.

"AEC guidelines for siting reactors say this size plant should be 20 miles away. Why not build the reactor out in the country?"

### The pro from Con

Con Edison marshalled its engineers to reply: "Everything will be all right. Our array of safety devices will prevent any accident. Even if there is an accident, the containment dome around the reactor will prevent radioactivity from escaping. Our previous experience shows that dumping of low-level radioactive wastes will be well below the limits set by the AEC, which themselves are low enough to guarantee complete safety. And no one has yet spilled radioactivity while shipping high-level wastes or spent fuel.

"It is true that nuclear power will at first cost as much as con-

ventional power, but we expect nuclear fuel prices to drop in the future while oil prices go up.

"You are misinterpreting the AEC guidelines. The way we read them, this type of plant can be right inside the city. If we built the plant in the country, it would cost too much to build power lines into the city. You are holding up progress."

## Long shot

Finally some local scientists came forward to put the whole issue into clearer perspective, saying: "Con Edison's plans are probably as safe as modern engineering can make them, but not perfect. It is impossible to calculate accurate odds on the chances for a serious accident. We haven't had enough experience with power reactors. We can say the chances are extremely small, but the chance does exist. On the other hand, the possible consequences of an accident are very large."

The worst accident, so unlikely as to be of only academic interest, is the unleashing of all the radioactivity in the reactor. Ravenswood would have 226,000 pounds of uranium oxide enriched so that 3.5 percent of the uranium is radioactive U-235. During operation, the amount of radioactive elements increases greatly. If it all got loose, about 8,000 square miles would have to be evacuated in a long, narrow zone downwind. About 4,000 square miles would be unusable for two years, and about 1,200 square miles for five years. People would be killed in an area extending roughly 10 to 50 miles—or roughly as far as two-thirds of the way to Philadelphia.

However, the way a reactor works limits the size of an explosion that could scatter radioactivity. A reactor takes the place of a conventional oil- or coal-fired furnace. Its fuel is U-235. When a U-235 molecule breaks apart, or fissions, it sends a fast-flying neutron crashing into other molecules. If enough fuel is concentrated enough, each U-235 fission will cause one additional fission. This is a chain reaction. At the higher concentration inside a power reactor, one U-235 fission will cause more than one additional fission. The reaction accelerates.

## The worst that could happen

Movable control rods absorb neutrons to keep the reaction in check. Should they fail, the reaction will become faster and faster until it runs away out of control. But the faster reaction generates more heat. In a Ravenswood-type reactor, increased heat automatically slows down a runaway, so there is more time for an emergency shutdown. Before a truly big explosion can build up, the reactor is torn apart.

The AEC thinks a runaway is so unlikely that it considers a break in the cooling water pipes the Maximum Credible Accident (the worst thing that could happen). The reactor would then melt, sending

Anthony Pagano works across the street from where the reactor will be. He is resigned to it. The neighborhood has a patchwork of industry, but the big working population streams each morning into the office buildings across the river.

steam, and radioactive gases and particles into the air.

The next line of defense will be a four-layer dome. It will have an inner quarter-inch-thick steel shell, then two and one-half feet of concrete, a second steel shell, and finally an outer five and a half feet of concrete. Con Edison says the dome is so strong that a jet liner could crash into it without breaking through.

Fans will suck up any radioactivity that leaks by the inner steel shell and dump it back into the building.

With these safeguards, can everyone relax? No. Every day, there will be radioactive wastes to guard and get rid of. Liquids will be concentrated, mixed with cement and sent to dumping grounds along with hot debris like broken lab glass.

Weakly radioactive water will be dumped in the East River, and gases will be leaked from the stack. There is a lot to learn about how these low-level wastes can harm people. We also know a lot, and what we know seems to show there is little danger from such small amounts of radioactivity.

## The con from Con

The big shipping problem is spent fuel. Fortunately fuel is replaced only about once a year, and only a portion at a time.

Fuel is a lot more radioactive when it leaves than when it arrives. Fuel elements will travel to Ravens-

wood in wood crates on the back of a truck; they will leave in lead-lined casks each weighing almost 100 tons loaded. They may go by barge and rail, or they may go by truck.

Fuel and fixed costs at Ravenswood will be higher than for a conventional plant; operating costs, lower. The total will be the same—7 mils (0.7¢) per kilowatt-hour. Within two to three years, Con Edison expects its nuclear fuel costs to drop by 0.5 mil. This will be too little to lower consumer prices.

Thus there is little or no *immediate* advantage to nuclear power. Elsewhere the situation is similar. Nuclear fuel is just becoming competitive with oil, coal and gas in the high-fuel-cost areas of the Northeast and the West Coast.

With the cost of nuclear and conventional power so evenly matched, Con Edison can't afford to put the nuclear plant out in the country. It would cost an extra $100,000,000 for underground transmission lines.

How does Con Edison expect to get around AEC distance limits which opponents often quote?

First of all, one set of limits arises from a misunderstanding. When the AEC first proposed the siting guidelines in 1959, it included some minimum distances. There was to be an exclusion area under the utility's control one quarter mile in radius, possibly one half to three quarters of a mile for large power reactors. The distance to the nearest town was to be several miles and 10 to 20 miles to the nearest large city. After many objections, the AEC dropped minimums from its final, March, 1962, guides.

The second set of distance limits depends on interpretation. With its request for a construction permit, Con Edison had to submit a Preliminary Hazards Survey. In it, engineers enact on paper the Maximum Credible Accident. Their key calculation is the probable radiation exposure in the surrounding territory. Generally, exposure drops as distance from the reactor increases. The distances to certain radiation levels become the distance limits.

### How far to a city?

The AEC, in sample calculations published in the guidelines, assumes a dome that provides no shielding and has a small leak. For a reactor the size of Ravenswood the sample exclusion area would extend one mile, the low-population-zone over 15 miles, and the distance to the nearest population center with over 20,000 residents, over 23 miles. In addition, the guides say, ". . . In some cases where very large cities are involved, the population center distance may have to be greater than those suggested by these guides." Reactor opponents want to hold Con Edison rigidly to these figures.

The guides, however, were never meant to be rigid rules. They were to be flexible enough for the fast-moving technology of the nuclear field. Con Edison has used the

Homes push into the shadow of a conventional power plant next to the proposed site. A new school will be up the street.

built-in flexibility to come up with zero for all three distances.

It says the containment dome is so thick that no harmful amount of radiation can penetrate to the outside. And Con Edison says none of the radioactive material floating around inside after an accident will leak out. Thus, no radiation exposure, no distance limits.

Such claims for the dome and other safety devices irritate some scientists and engineers. Seymour Melman, professor of industrial engineering at Columbia University, says, "Those in favor of the plant are so vigorous in their advocacy that they tend to imply they've discovered a 'foolproof' technology, which doesn't exist."

The AEC will have to decide just how flexible the guides are. It usually takes about a year to act on a construction permit. The AEC staff and the Advisory Committee on Reactor Safety hand over public reports to a three-man safety and licensing board, which holds a public hearing before making a decision. (Some people contend that the real decision is made in the two reports, so the public hearing comes too late to give opponents much influence.)

AEC commissioners make a final review. Three out of five is a quorum and a majority vote rules, so as few as two out of five commissioners could OK a reactor. The state senator from Queens, Seymour Thaler, wants a bill introduced in Congress to require a unanimous vote of the full commission on a big-city power reactor.

With a construction permit in hand, Con Edison can start building. Later it must get a second permit allowing it to load the reactor and start slowly raising the power output.

## Schizophrenic AEC

Three unions challenged this licensing procedure in 1956. They claimed that after millions of dollars had been spent on building there was little likelihood that an operating permit would be refused.

The safety of the reactor should be completely established when the construction permit was granted, they argued. The Supreme Court upheld the AEC licensing method.

Other critics of the AEC point out that the Commission has the responsibility for both promoting and regulating the nuclear power industry, so regulation could suffer.

It is difficult to find an expert who can make a disinterested judgment of AEC findings. To get an opinion on Ravenswood, the New York City Health Department may have to go outside the country.

Nevertheless, the issue is so complex that many nonscientists have thrown up their hands and cried, "Leave it to the scientists in the AEC."

Some scientists do not agree. Dr. Sidney Sokolar, a biophysicist at Columbia University and a member of the Scientists' Committee for Radiation Information, told the New York City Council, ". . . Science cannot tell you whether a nuclear reactor should be built in New York City. That, in fact, is why scientists disagree about it. . . . What science can do is to provide a picture of the advantages and of the disadvantages."

From there on, the issue is simply this: Are the benefits from each individual reactor worth the small, but unknown, risk of a potentially serious accident?

That question, some scientists believe, is a social and political one that politicians should decide.

### *Borneo baby ring busted*

BABY smugglers in Singapore were recently stuck with 85 orphans they couldn't get rid of. The babies were orang-utans smuggled out of Sumatra and Borneo. Their next stop on the smuggling route was to have been a clearing house in Bangkok, Thailand, which was shut down after a raid. Their eventual destination: unsuspecting zookeepers who would have paid about $2,000 for each.

There are only 3,000 to 4,000 orangs left in the world. To get babies, poachers have to kill the mothers. Later, half the babies die before they reach a zoo. Wildlife conservationists became alarmed at the slaughter, backtracked on the smugglers' trail, and tipped off the police. (Meanwhile, a second clearing house sprang up in Japan.)

Singapore customs officials won't let the hot apes out of the country, so the stranded babies may be slaughtered. But there could be a happy ending. The conservationists hope to buy the apes and send them to sanctuaries in Thailand and Borneo. First, however, the apes will have to go to a jungle school in Sarawak for survival training. Many of the youngsters can't even climb a tree without help.

PIX

# WHAT MAKES YOU HAPPY

## A systematic study of the ingredients of happiness turns up some fascinating facts and points the way to better mental health.

For some people, the universal search for happiness is easy. There are even people who can maintain a sense of cheerful well-being in the face of great misfortune. Others become extremely depressed over the slightest adversity.

Why?

A possible explanation has been uncovered in a pioneer study of the average American, "In Pursuit of Happiness," by the National Opinion Research Center at the University of Chicago.

Happiness, says Dr. Norman M. Bradbury, the psychologist who conducted the study, is not the mere absence of negative experiences, or even the number of negative experiences one has, for it is not uncommon for a man to report

being "very depressed" and still describe himself as "very happy." Happiness depends on the number of positive satisfactions—the good things in your life.

What do the positive satisfactions come from? Largely, it seems, from participating in the life around you—meeting and talking to friends and relatives, and going places.

What about people who don't seem to feel much of anything—who neither enjoy nor are depressed by things? Are they just covering up their feelings? Apparently not. The study finds that there are those who really are less sensitive to feelings—good or bad, than others. Women reported slightly more feelings than men, but what made the big difference was education.

"One important characteristic of people with higher education and income is their increased emotional sensitivity and psychological responsiveness to their environments," the study finds. The educated have more problems, but they are also more likely to be happy. They are, in the language of the psychologist, more affective.

A commonly held idea shattered by Dr. Bradburn's findings is the picture of the happy bachelor. Popular notions notwithstanding, married men seem to be a lot happier than unmarried men. And although unmarried women were found to be a little less happy than their married counterparts, they were still happier than the single men. Contrary to the impression that being unmarried is the worst thing that can happen to a woman, it seems that marriage is far more important to men. Dr. Bradburn admits that this finding is based on a relatively small number of cases, but points out that it is consistent with the results reported from much more extensive studies. "We might note also," he writes, "that widowers and divorced or separated men are more likely to be unhappy than women in similar situations."

A little "bundle of joy" does not necessarily make for a happy marriage. In fact, having children in the house increases the likelihood of tension between a husband and wife. But a previous marriage doesn't seem to be any problem.

### Togetherness works

Those couples who did things together had generally less tension than those where each partner was more independent. Familiarity does not breed contempt. And those couples who had been married twenty years or more reported far less marital tension than those married ten years or less. "It seems likely that this result is due both to a gradual accommodation between marriage partners over time and to the fact that marriages with high tension would probably have broken up before too many years had passed," the report states.

Can money buy happiness? Yes, to a certain extent it can. Income seems to make relatively little difference to the young, but a great

**You can have a bad job, a bad marriage and a lot of other bad things in life, but that still doesn't kill your chances for happiness.**

deal of difference to those who are older. "Among the poor, it might be said, life ends at 40," Dr. Bradburn comments.

How about education? College-educated persons with incomes $7,000 or over a year are happier than persons with eighth-grade education or who make less than $3,000 a year. But when income is the same, the highly educated are not as happy as the poorly educated. The reason for this may be that poorly educated have achieved more than they expected.

### No joy in retirement

Work is of crucial importance to the happiness of men. Among the unemployed, 33 percent reported that they are "not too happy" as against 12 percent among men who were working. Men who were retired or otherwise not in the labor force (mainly those who had disabling injuries) were nearly as likely to report being not too happy as were the unemployed men. The most satisfied workers were those who felt they were part of a work group, and felt they had a job that used all their skills.

Among women, the situation was entirely different. Those women who are not in the work force, full-time housewives, were just about as happy as working women. "In view of the increasing proportion of women in the labor force," the report comments, "the conclusion is somewhat startling."

One fact above all stands out in Dr. Bradburn's study. A person can have a bad marriage, an unsatisfactory job, and a lot of other bad things in his life, and still be a happy man. In the language of the psychologist, "Maladjustment in social roles is associated only with an increase in negative feelings and not with a decrease in positive feelings.

"It would appear," the report continues, "that problems in marriage and work contribute to a decrease in happiness, not by having any significant effect on the amount of positive feelings a person has, but by significantly increasing negative feelings and thus tipping the balance of feelings toward the negative side. Thus high marital tension or job dissatisfaction may not necessarily produce unhappiness if they are offset by a sufficient amount of positive feelings."

A careful analysis of the data shows that the one factor most closely related to these positive feelings is what is called "social interaction." That means simply seeing friends and relatives, meeting new

people and, to a lesser extent, getting out and going to a restaurant, for instance, or a sports event.

Sitting home and watching television just doesn't do it. In fact, for those respondents who had more education and a better income, there seemed to be a slight tendency to have higher positive feelings when they watched less television.

"There is one reversal to this general trend in association between greater social participation and higher positive feelings, and that has to do with the number of church or church-sponsored events attended," according to the report. Men who came from a lower social class and who attended a lot of church events were less likely to have positive feelings. The reverse was true for men of the higher social class.

### Don't worry

"While we need a larger number of cases to explain this difference, definitively a possible interpretation might be that our low SES (socio-economic class), high-religious participators come from predominantly fundamentalist Protestant groups which frown on many sorts of social activity."

How about worries? "The relationship between happiness and worries is a particularly intriguing one," Dr. Bradburn writes. "One view of the relationship is that the happy person is free from worries, or as nearly free as possible. Another view, holding the worry-free individual to be a pathological case denying his anxieties, pictures the happy man as one who has a healthy amount of worry.

"Judging from our sample, it would seem that the 'carefree' model of happiness has much merit, for reported happiness decreases as intensity of worry increases." Dr. Bradburn notes, however, that the content of worries varies greatly with age and social class.

The study was undertaken because the investigators felt there is a basic lack of knowledge about the behavior of people who lead normal lives. The report suggests that there has been too much stress on the study of mental illness without really defining what mental health is:

"With more detailed knowledge of how people live their lives, what problems they encounter in their everyday activities and how they cope with these problems, how they view their relations with other people, and how they spend their time, we will be in a better position to determine the nature of mental health as well as to study the causes of mental illness."

The survey was conducted in four small Illinois towns, two that have chronically depressed economies, one with an improving outlook and one that has enjoyed continued prosperity. The communities ranged in population from 3,085 to 9,027.

From each of the towns, a sample of 450 households were studied. Interviews were conducted with 393 men, aged 25 to 49, and self-ad-

ministered questionnaires were collected from another 1,613 men and women. Of the total of 2,006 persons, 24 percent said they were "very happy," 59 percent, "pretty happy," and 17 percent "not too happy." A detailed breakdown and comparison of these raw figures, however, produced some significant and often surprising results.

## Lucky to have a job

What difference did the economic climate of the various towns have on the psychological well-being of their inhabitants? A man making a poor salary in an area with a lot of unemployment was likely to be more satisfied with his job than a poorly paid worker in a prosperous community, probably because he considered himself lucky to have any sort of job.

But unemployment is bad for a person, no matter what kind of town he lives in.

And the poor and elderly in depressed communities, where many young people have left to get jobs in other areas, are worse off psychologically speaking, than the poor and elderly in younger and wealthier communities. Misery does not love company.

"The main consequence of a 'depressed economic climate,' " the report states, is "an absence of positive satisfactions in life rather than an increase in negative forces. It is the lack of 'joy in Mudville,' rather than the presence of sorrow, that makes the difference."

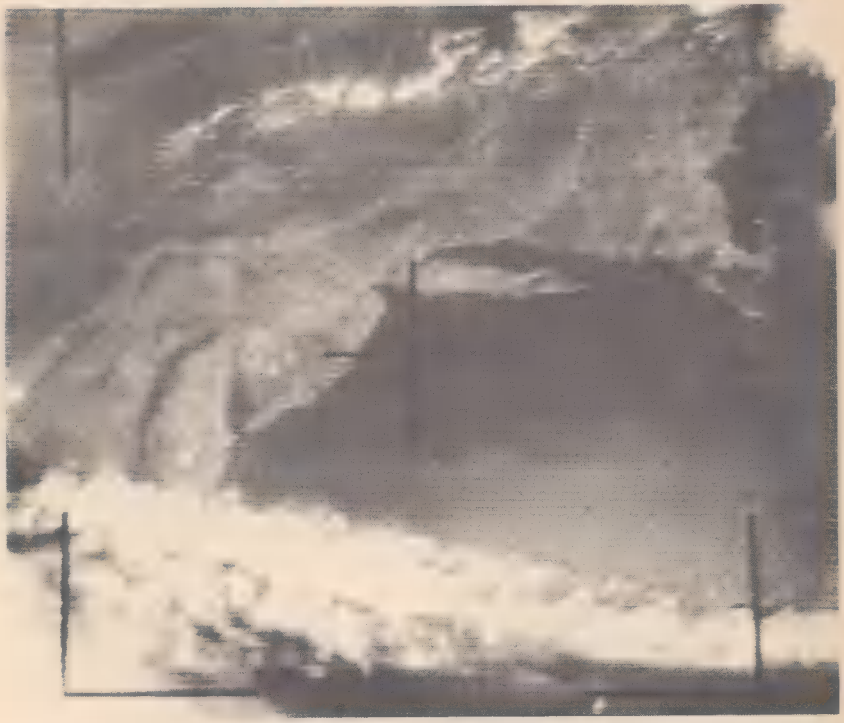
A bad economic climate seems to alter people's degree of involvement in their social environment. At the same time, there seems to be a strengthening of family ties. "People withdraw from the world into the relative safety of the family."

How can you be happy? Dr. Bradburn's report makes no claims at presenting a formula for the good life. But some conclusions might be drawn from the findings regarding the two dimensions of happiness —positive and negative feelings.

Perhaps there is little one can do about the negative things—the dissatisfactions of life. But the outlook for happiness is not hopeless if the bad things can be outweighed by satisfactions. And the most important, it seems, is an astonishingly simple one—friendship.

". . . and if the Russians do attack, all I do is press this button . . . whoops — —"

# Do you know your weather?



NASA

This photo made by the new Tiros VII weather satellite shows the Eastern Seaboard from Cape Cod to Chesapeake Bay. Such photos are an aid in predicting the course of storms.

by John and Molly Daugherty

SURE, everybody talks about the weather. Here is a chance to find out if you know what you are talking about.

1. Although clouds are made of water droplets and/or ice crystals, rain doesn't fall constantly from the clouds because:
   a. Static charges hold the water droplets in place.
   b. Water droplets are too small.
   c. Water droplets are too high up.

2. When smoke goes up a chimney, spreads, and bends back to earth, it gives you an indication of the kind of weather to expect. You can forecast:
   a. A clear day.
   b. Strong winds on the way.
   c. An approaching storm.

3. The weather condition responsible for the greatest number of automobile accidents is:
   a. Fog.
   b. Snow.
   c. Rain.

4. Of the three following weather conditions, the one that lasts the shortest period of time in passing is:
   a. A warm front.
   b. An air mass.
   c. A cold front.

5. Can you stand a scorching hot day in late summer more easily than one in early summer?
   a. No. Your body is ennervated by the long summer heat.
   b. Yes. Your body has had a chance to acclimate itself to heat.
   c. Heat is heat no matter when we experience it.

6. When you start out on a picnic, can you trust the "settled-fair" reading on your home barometer?
   a. You can trust it if your barometer is new.
   b. Yes. A high barometer reading always signals fair weather.
   c. No. A single fixed reading has little forecasting value.

7. If you slice a hailstone in half you will find:
   a. A center of water encased in ice.
   b. Onion-like layers of ice.
   c. Solid ice like that in an ice cube.

8. When there's dew on the grass on a fall morning, you can expect:
   a. A fair day.
   b. A thunderstorm.
   c. Rain before evening.

9. If you camp on a mountain in summer, why would you be wise to build your fire downhill from camp at night and uphill in daytime?
   a. You'd get more heat from your fire this way.
   b. Your fire wouldn't go out so easily.
   c. Smoke wouldn't blow into your camp.

## Answers and explanation:

**1-b** The growth of a cloud droplet from 1/25,000 of an inch in diameter to 1/125 of an inch or larger—a size large enough to fall out—is the cause of rain.

Gravity of course pulls on all matter, but these droplets are so small that moving air currents keep them up until they're big enough to fall.

In turbulent air, the paths and speeds of water droplets vary, causing frequent collisions. The droplets enlarge from this process.

**2-c** When a storm approaches, the air is very humid. Tiny smoke particles supply hygroscopic (ideal) material for condensation of the water in the air. Condensation on the smoke particles makes them heavy, and they fall back to earth. If the air were very dry, little condensation could occur. The smoke would rise and disperse.

**3-a** Places most likely to have fog are low spots in valleys, sea coasts where winds blow over cold water toward land, and tops of hills and mountains.

Valley bottoms on clear, still evenings in the proper season frequently develop radiation fogs. The earth cools off and cools the air. As the air cools, its humidity increases. Fog develops if there is a fine balance between moisture supply, rate of cooling, and degree of turbulence of the air so that condensation takes place near the earth's surface.

Mountaintop fogs are advection (upslope) fogs. Warm, moist air being pushed up mountains cools rapidly to produce condensation.

**4-c** Cold fronts are fast moving and sharp-angled. They may move 2½ times as fast as warm fronts. Rains associated with cold fronts are short but hard. As a cold front passes over a point of the earth's surface, its front-to-rear depth is much less than that of a warm front—which cuts down time in passing.

**5-b** Sweat glands go into action to cool you off. At first they aren't 100 percent efficient. As summer progresses, your body produces more sweat more effectively and you tolerate heat better.

**6-c** The pressure tendency is far more important than the momentary reading. The pressure tendency is a record of how much the barometer rises or falls in a period of time (usually three hours on weather maps). If the barometer has been falling steadily, the "settled-fair" is due for a change to stormy weather.

**7-b** Hail starts as frozen rain. An old theory is that raindrops enlarge while colliding with one another in violent downdrafts and updrafts in thunderclouds. As updrafts carry them in subfreezing zones, the raindrops become solid ice. Many round trips add successive layers of ice until the hailstone becomes so large it falls out of the thundercloud.

Today many meteorologists believe only one descent of the raindrop through a deep subfreezing cloud layer occurs. On its way it encounters many ice-cooled water droplets and snow flakes which freeze around it on contact.

**8-a** Dew forms only when the air is relatively clear and dry. The lack of cloud formation allows the grass to cool off rapidly by radiation so that the air next to it cools to the condensation point. Dew does not fall, but comes directly from the air around the grass.

**9-c** After dark, mountain air cools off more than valley air. The greater pressure of the cool air causes it to flow downhill. The smoke from your fire just below camp would blow away from you.

In daytime the sun warms mountain slopes rapidly, heating air over the slopes more than it heats air over the valley. Then the cooler valley air pushes the mountain slope air uphill, so the campfire should be above the camp.

## Score yourself:

**8-9 right**—With your knowledge of weather you're safer betting on the weather than on the horses!

**4-7 right**—Even the weathermen have to make educated guesses.

**0-3 right**—Maybe you think a micrometeorologist is a short weatherman!

# Nature thought of it first

by John Sidney

**Wasps and bees built the first housing developments, and the first balloonists and deep-sea divers were spiders, not men.**

SURROUNDED by products of his inventive skill, man may forget that many of his feats of mechanical ingenuity were anticipated long ago by nature.

Consider the devices of architecture—domes, flying buttresses, arches and pillars. The earliest dome was in the shells of turtles and tortoises. As life left the seas and took first to the land and then to the air, many types of domes were built for shelter.

Most skilled of nature's builders are probably mason bees and mason wasps. The female mason bee dovetails big pieces of gravel carefully together to build a cell for her eggs. For mortar, she uses dry limestone clay with a little sand and kneads this into paste with her saliva. The bee builds one cell at a time, lining it inside with mortar and stocking it with an egg and honey for the grub. On this first cell others are built.

Similar building methods are used by the mason wasps of North America, Britain, Australia, North Africa, India and Malaya. Some members of this family are popularly known as mud-daubers and potter-wasps in the U.S. The female potter-wasp builds urn-shaped nests of clay in

trees. These little vessels are thought to have been the models for early Indian pottery.

Nature anticipated the flying buttress aeons before man attempted it. In Asia, in the banyan groves, the aerial roots of the banyan, a member of the mulberry family, grow down from the branches, reach the soil and form supporting pillars or buttresses. A banyan, although frail-looking, will resist all but the most violent of winds.

### Roots shaped like arches

So, too, the mangrove of the mud flats of Asia anchors itself by its flying buttresses. Its trunk and branches grow roots which descend in arched fashion to reach the ground and dig in.

The first paper-makers were wasps. The paper-wasps, which live in colonies, belong to a family called *Vespidae* of which the genus *Polistes* is found in the U.S.A. as well as in India and Australia. They have sharp stings—hence the popular name of hornets.

The female founder of the colony goes into the paper-manufacturing business every spring. She scrapes wood fibers from tree trunks with her mandibles (the upper two parts of the jaw) and mixes them with her saliva to make a coarse brown paper. With this, she builds the first few cells for her colony, lays eggs, and feeds the larvae. When the first adult workers mature, they take over the work of the colony—except egg-laying which remains the queen's sole task. Throughout the summer, the paper-making continues and the nest may grow up to a foot in diameter.

Jet propulsion is the "first" of the squid. A tubular siphon in its body sucks in water and squirts it out again. With each outward jet its body is forced through the water.

Another sea-dweller equipped with jet propulsion is the scallop of British waters, a mollusk with a fluted shell. When disturbed it moves through the water in a series of jerking motions; water is taken in through valves and squirted out through slits on either side of the hinge of the shell.

Notable among nature's balloonists are the young orb-weavers or garden spiders who spin themselves

There's nothing new about jet propulsion. The squid has been getting around that way for years, and so has the octopus.

a balloon and float away when it comes time to leave the maternal shelter. They emit fine filaments of silk from their spinners and these gossamer threads are carried up by the sun-warmed air until enough is spun out to make the spiderling airborne.

Long distances are often covered by these "balloonists." They have been found in the rigging of ships several hundreds of miles out at sea. They have been seen at a height of 27,000 ft. Some spiders common to North America and Europe are thought to have bridged the Atlantic in this way.

Nature invented skis for Australian kangaroos and wallabies. The long foot of both kangaroos and wallabies is a perfect ski for riding over loose, dusty soil instead of sinking into it.

Lamps and candles, too, aren't new. The young of some birds that nest in the dark hollows have lights in their mouths to guide their parents at feeding time. The nestlings of some Australian finches have white or flesh-pink mouths inside. At the back are three rounded spots in the form of a triangle and in the dark they shine with an opalescent luster. The young of the Australian nectar-eating parrots have luminous sides on their mouths.

Nature has provided fireflies with lights to bring lovers together. The male flashes his lamp to win the female's favor. If she likes it, she responds with a weaker flash and guided by the winking love beacon, the male finds his way to her.

A tiny water spider of Europe and Asia builds itself a diving bell in ponds. This diving spider attaches itself to the stem of a water weed. There on the bottom of the pond it spins a dome-shaped nest, mooring it with silken threads to stems and leaves. The spider then swims to the surface to bring down bubbles of air on its hairy legs. It scrapes these off under the open mouth of the bell and then returns to the surface for more until the dome is full of air.

The English wolf spider carries its air along with it underwater like some human divers. This spider carries bubbles of air in its hairy body and has been observed to stay under

Man has no priority on the use of electricity. A shock from a five-foot electric eel has been known to knock a man down.

water for ten hours. Close cousins of the wolf spiders are some amphibious spiders which run over the surface of the water and even submerge for some minutes at a time carrying air on their legs.

The ability to take air down under water when hunting mosquito larvae and other small water-life is also shared by the group of insects popularly called back-swimmers. These long streamlined bugs swim on their backs: their abdomens have a keel along the center and on each side of the keel is a groove which holds air.

## Snorkel abdomens

They swim strongly under water, every now and then resting on their oars as it were, to rise slowly to the top until the tips of their abdomens break the surface. With their air supplies renewed, they dart down again.

The larvae of the drone-fly of Europe, a bee-like insect, anticipated the breathing-tube of the modern deep-sea diver by a few million years. These larvae live in drains in damp decaying matter collected in the leaf-sheaths of plants and in the fluid remains of animals. The grey larvae have slender hollow tails which they can lengthen or shorten to reach the air at the surface of the liquid in which they are living. So long are the tails that the larvae are popularly known as "rat-tailed maggots."

Electricity was generated first by the torpedo rays, electric eels, electric catfish, cramp or numb fishes, some skates, and a number of other lesser known fishes.

The electricity generator of the torpedo ray consists of a series of cells, rather like honeycomb in shape, on each side of the ray between the head and the pectoral (or breast) fins which are behind the gills. The cells are filled with a jelly and equipped with a special nerve system.

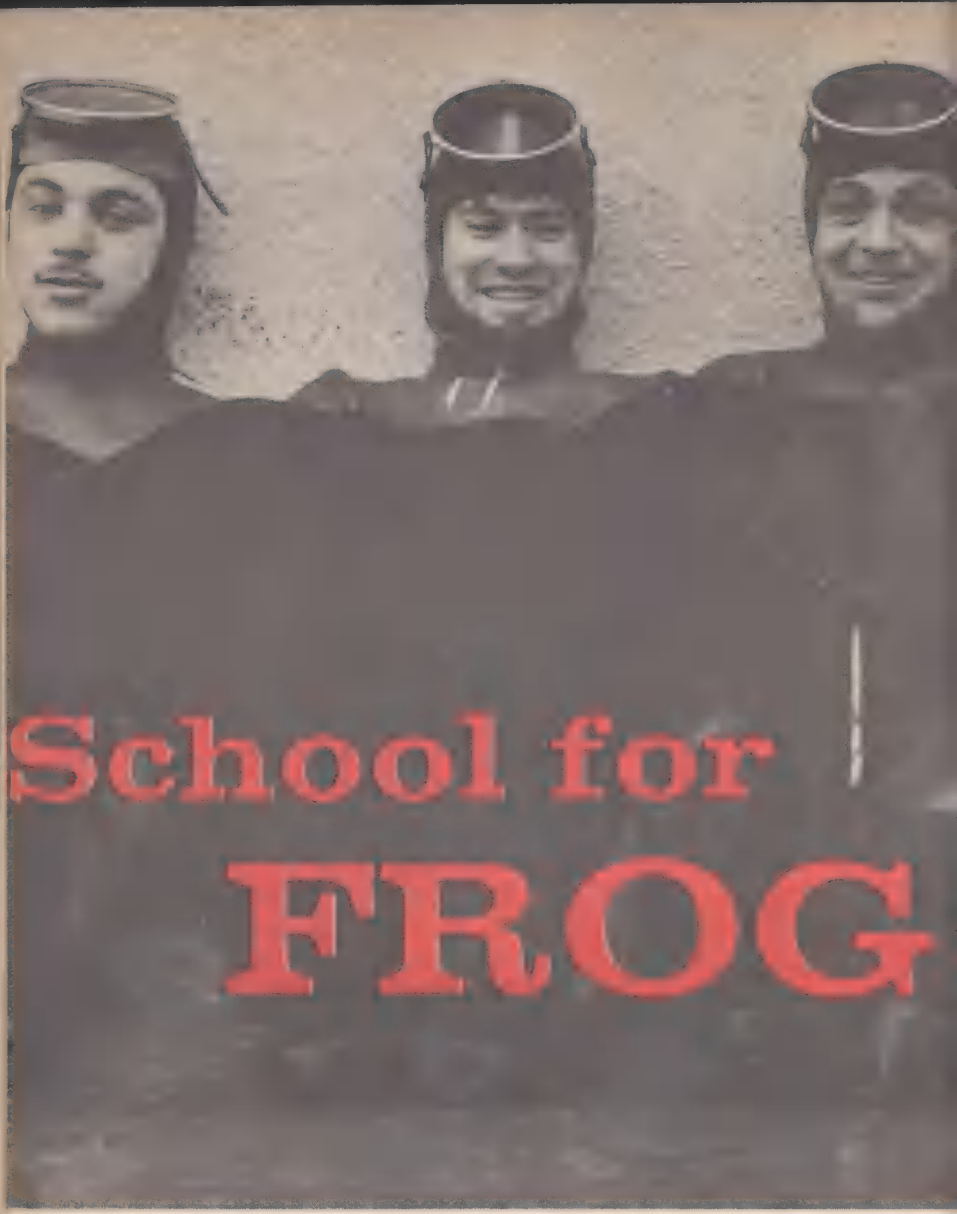
In an experiment, a ray was made to complete a circuit and it lit a globe for a few seconds. The shock won't kill a healthy man, but is deadly for small sea creatures.

The electric eels of North America pack an electric wallop—a shock from a five-foot-long eel has been known to knock a man down.

Although a full-grown elephant may weigh four tons, his feet don't break under the strain. Nor do they slip or bog down on slippery or muddy ground. His feet have shock absorbers as well as non-skid treads.

In each heel is a mass of elastic gristle, much like crepe rubber, which absorbs shocks and jars. When he walks over soft muddy ground, the soft spreading "crepe rubber" stops him from sinking in too deeply. Its contraction as the weight is taken off allows the elephant to draw his foot up easily through the mud. The horny sole of the elephant's foot is corrugated with creases like a tire tread.

A final thought: there is, so far as we know, no record of nature having been first with the atom bomb. Perhaps she was much too wise.



# School for FROG

You can always recognize a graduate of the Sogetram school by the way he dresses—rubber suit, flippers and mask.

This unique institution located at Garennes-sur-Eure, France, is Europe's only school designed especially for training frogmen.

These fellows are not in school just for fun. With the growth of underwater technology, frogmen have come to be very much in de-

mand. They may be found at the bottom of the ocean doing salvage work, in rivers and canals repairing dams and piers damaged by storms, and doing a variety of maintenance work on aqueducts.

The school's entrance requirements place moral, mental and professional qualifications on the same level as the student's physical condition (see next page.)

(All photos: Three Lions)

Underwater soldering and metal cutting are among the most important skills a professional frogman must learn. Here a student works with an oxy-acetylene torch.

An instructor checks the diving gear of a student frogman. There are several types and thicknesses of diving suits to choose from, depending on the temperature of the water and the type of work that is being done. The school also conducts experiments with different types of equipment.

The dining room at the frogmen's school is a bit more informal than the dining rooms found in more conventional schools. At the end of a six-month period of instruction, the apprentice leaves the "campus" to get on-the-job training.

In one maneuver a relief man submerges without oxygen and takes the tanks of the other diver, who must surface at once.

Divers get much of their early instruction in a diving pool fitted with portholes so instructors can watch their work.

# the progress of MEDICINE

by Arthur J. Snider

## Reducing formula: Starve!

If you weighed 250 pounds or more and wanted to lose a lot of it, the chances are Dr. Garfield G. Duncan of Philadelphia would put you on a starvation diet.

You would be put into a hospital for two weeks and given no food, only water and vitamins. During the first 24 hours, you would lose five to 10 pounds, largely in salt and water. Thereafter, your body would live off its own fat stores.

The broken-down products of fatty acids, slowly released into the blood stream, would have the effect of suppressing appetite. After the first two days, you would no longer be hungry. At the end of two weeks, you would have lost 30 to 40 pounds.

Dr. Duncan reported to the American Medical Association convention recently on 300 men and women who have been subjected to this treatment. Most were between 40 and 60.

After they are released from the hospital, patients follow ordinary reducing diets of 1300 to 1500 calories daily for women and 1500 to 1900 for men. This is eaten six days out of the week. The seventh day of each week is reserved for total fasting. This permits a more liberal diet on the other six days.

On this regimen, a long-term reduction of 1½ to 2½ pounds a week can be achieved. Patients who are discouraged with losses at this slow rate are reminded this amounts to 70 to 104 pounds a year.

For extreme degrees of obesity, two fast days in ten are recommended.

Physical exercise beyond walking on the level is not encouraged for the severely obese but as the weight is reduced, walking is stepped up.

Dr. Duncan reports that patients whose weight exceeded 300 pounds eventually resumed competitive sports, including golf and swimming.

Results of the experiment thus far: Twenty percent of the 300 patients treated have achieved a proper weight. Forty percent are maintaining the weight loss attained in the hospital. The remainder are reducing failures.

Fat people who protest they eat very little yet hold their weight may have some scientific support. Dr. Edgar S. Gordon of the University of Wisconsin Medical School says some individuals have an enzymatic abnormality causing faulty food conversion. Practically all carbohydrate is converted into fat.

Dr. Gordon has devised a special nibblers' diet. It consists of a 48-hour fast followed by a 1,200-calorie diet taken over six feedings a day. This is supplemented with administration of a drug to oxidize sugar, and a weekly diuretic to facilitate removal of water from the body.

It's not what you eat, but how much that counts, says Dr. Laurance W. Kinsell, Institute for Metabolic Research, Oakland, Calif. So long as the calorie level remains constant, the rate of weight loss is the same whether the diet be high in carbohydrate and low in fat, or the reverse.

## Alcohol and TB

Contrary to the impression in clinical medicine, a drink or two has no adverse effect on tuberculosis—if the imbiber is a guinea pig, that is.

Dr. J. Robert Thompson of the Municipal Tuberculosis Sanitarium, Chicago, used guinea pigs in an experiment to test the theory that chronic alcoholics have a greater tendency to reactivate their dormant tuberculosis than non-drinkers.

A quiescent type of tuberculosis first was produced in a group of guinea pigs by infecting them with the disease and then treating them with drugs. After a few weeks, ethyl alcohol cocktails were administered five times a week. In an examination it was found the alcohol did not alter the amount of tuberculosis in the lungs, liver or spleen.

## *Illness by guilt*

When a patient unintentionally withholds his real reason for coming to see the physician and offers a substitute complaint, doctors call it a "red herring."

This is neither a deliberate deception nor a repressed emotional conflict emerging as a new symptom, says Dr. Herman Hirsh of Temple University Medical Center, Philadelphia. The patient is trying to avoid anxiety, shame or guilt about his actual needs.

He may go from one physician to another hoping that someone will reach out and come to grips with what is really troubling him. This

is termed the "calling-card maneuver," says Dr. Hirsh.

A 37-year-old woman's chief complaint was headache and ringing in the ears. Her appetite was poor. She slept fitfully and complained that her husband could not fulfill her needs for sympathy and understanding. While her children were in school, she would try to do her housework but the head noises troubled her so much she would stop everything and rush to her mother's house up the street. Further inquiry revealed her symptoms had begun shortly after the miscarriage of a fourth and unwanted pregnancy about which she felt guilty. After reassurance about her physical well-being, she improved.

Adolescents often seek help from their family doctor for benign symptoms which hardly seem to warrant medical consultation. Usually the problems relate to sex.

When a physician suspects a "red herring," he uses these simple rules: Listen until the patient has nothing more to say, be warm and interested but remain objective and skeptical, ask questions that lead the patient to reveal himself.

## Athletic Asthmatics

Young boys with asthma are usually "watchers" when it comes to athletics. Dr. Thomas R. McElhenney of the University of Texas has converted a group into "doers" and they averaged an 18-percent increase in lung capacity.

There also was a 30-percent reduction in the number and severity of asthmatic attacks and an equivalent reduction in the need for drugs.

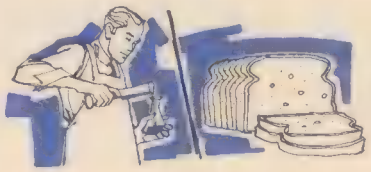
Twice a week for four months, the boys, ages 8 to 12, took part in games, relays, and later competitive games to develop strength, endurance and skill.

He recommends that school boards create remedial or adapted programs of physical education for all asthmatics in the community.

## *Joke: Bread is made from wheat*

Foods themselves are usually blamed in food allergies, but Dr. Orval R. Withers, associate clinical professor of medicine at the University of Kansas Medical School, believes many of the allergic reactions are due to drugs, chemicals or antibiotics contained in the foods to preserve, disinfect, tenderize, bleach, sweeten, color or flavor them.

As an example, Dr. Withers cites wheat.



First, it is treated with a variety of chemicals between planting and harvest. After the wheat is milled into flour, chlorine, nitrosyl chloride or benzoyl peroxide are used to bleach the flour. It is then enriched with iron, calcium, vitamin D, as

well as vitamins niacin, thiamine and riboflavin.

Other chemicals are added in the baking process. Emulsifiers, such as sodium diacetate, calcium propionate, lactic acid and monocalcium phosphate, are mixed into the dough to retard the growth of molds.

At least 16 different chemicals have been added to the bread before it is eaten, Dr. Withers stresses.

### *Mothers who lose their hair*

Losing hair after childbirth is a frightening experience to women.

They need not worry, says Dr. Bencel L. Schiff, dermatologist at Boston University. The hair will grow back.

He bases this on a review of clinical records of 84 patients with hair loss, a condition known medically as "postpartum alopecia." Only two women did not get their hair back completely.

Most of the hair loss occurs between eight and 16 weeks after delivery. Two-thirds of the hair returns in five to six months.

### Coffee and your heart

Add coffee to the list of factors associated with the development of coronary heart disease.

The association does not become apparent unless consumption is heavy—five or more cups a day.

The finding has come to light in a continuing study being conducted at a Western Electric Company plant in Cicero, Ill. For the last six years, 1,989 men between the ages of 40 and 55 have been examined at regular intervals. The coronary victims have been compared with the non-coronary group.

Factors observed to a greater degree in the coronary group include elevated blood pressure, elevated cholesterol level, a history of chronic cough, a history of chest discomfort, early age of death of father, a history of peptic ulcers, electrocardiograph abnormalties, shortness of breath, use of cigarettes—and now, heavy coffee drinking.

Dr. Oglesby Paul, study director, says the association does not necessarily mean that coffee causes or even contributes to heart disease. It simply means that when coronary and non-coronary groups are compared, coffee-drinking shows up to a significantly greater degree in the coronary group.

It was found that 15 percent of the men in the non-coronary group drank between 150 and 190 cups a month as compared with 22 percent in the heart disease group.

Only 7 percent of the non-coronary group drank more than 200 cups a month as compared with 19 percent of those in the heart disease group.

The study thus far has produced some surprises in that no association could be found between heart disease and body weight, heart disease and occupation or physical exercise, and heart disease and diet (other than coffee). There is no support for those who say that a high fat diet is conducive to heart disease.

# People who love operations

THREE women not long ago underwent a total of 18 operations for removal of various organs and parts of their body.

They were addicted to surgery as some people are addicted to narcotics. They beseech doctors to operate to relieve their symptoms.

Psychiatrist Selwyn Brody of New York says the polysurgery addicts are expressing an infantile cry for care and attention, for which they feel starved.

Somewhat related is the Munchausen syndrome, named for the notorious Baron Hieronymus Munchausen, an 18th century traveler and teller of tall tales.

The typical patient with Munchausen syndrome is admitted to the hospital with an apparent acute illness and a dramatic case history.

He may come in with abdominal pain which appears to be severe enough to require narcotics. He may be able to induce bleeding from the stomach, lungs or nose. He may provoke a skin allergy by exposure to known offending agents.

Like the original Baron Munchausen, he tells harrowing tales of past medical experiences.

A Munchausen actor wears his abdominal scars proudly. The journal *Pfizer Spectrum* reports that one received 29 scars from hospital admissions in three countries.

One of the best known American patients of this type was a 39-year-old seaman who burst into the emergency room of the University of Iowa Hospital coughing blood and clutching his side in agony.

He said he had been stricken with pain on a bus en route to Chicago.

He gave an accounting for each of his scars—an appendectomy on board a tugboat in Ireland, a repair of an umbilical hernia in Chicago, a vein-stripping operation in Portland, Ore., an exploratory operation in Japan and an auto accident in San Francisco.

After 40 stormy days in the hospital, during which he stalked the corridors in a blood-spattered gown and intruded on staff physicians in their offices, he was slated for discharge. But he thwarted it by stabbing himself with a pair of scissors.

The pain the Munchausen patients will undergo is unbelievable.

Unless they are recognized by someone who has treated them before, the diagnosis is revealed only gradually by the patient's bizarre behavior.—*Arthur J. Snider*

Salvador Dali. The Persistence of Memory. 1931. Oil on canvas, 9½ × 13". Collection, Museum of Modern Art, New York. Given anonymously.

**H. G. Wells once wrote a startling story about a time machine. Of course it was sheer fiction. Then in 1905 Albert Einstein pointed out that time can do some odd things. Einstein's calculations did not actually match Wells' predictions—but they were equally startling. So . . .**

# We will now test the time machine

**by Sandy Spillman**

NEXT year a rocket will lift off a Canaveral pad with a most unusual payload in its nose cone—an atomic clock.

Physicists on Earth will monitor the time on that clock in an attempt to settle once and for all a scientific debate that has been raging for half a century.

EGO, for Eccentric Geophysical Observatory, will be launched into space by an Atlas-Agena booster late in 1964, to gather and transmit data on geophysical phenomena.

**By climbing back aboard his vehicle and traveling about in space, Joe can keep young and outlive his great grandchildren.**

Aboard will be a unique clock, to determine the validity of Albert Einstein's 'Time Paradox' set forth in his Special Theory of Relativity.

In 1905 Einstein stated mathematically that the faster a clock moves, the slower it runs. If this theory is correct, then time will be slowed down for an astronaut rocketing at great speeds toward a distant planet. All timely functions inside the spaceship, such as the pilot's biological and aging processes, will slow down; and the faster the spaceman travels, the slower time will become for him.

Assume, then, that in a magnified example Astronaut Joe Smith climbs aboard his capsule and is blasted off the globe on a flight twenty-five 'light years' away in space. A 'light year' is 5,865,696,000,000 miles—the distance light travels in one year.

Joe's wife, Mary, who is expecting a child, settles down for a long wait.

If Joe's ship travels at the speed of light, he should reach his destination in twenty-five years, then circle and head for home. Fifty years from his take-off date, Joe arrives back at his base.

However, since his spacecraft has been moving tremendously fast in relation to the Earth, all time processes in his ship have been slowed down. In fact, to Joe it may seem as though his entire trip took only a week.

To Mary, and everyone else on Earth, it will have been fifty years since Joe left. So when he hops out of his capsule, Joe will find Mary a fairly old gal; and will greet his new son—who is fifty years old.

### Contrary to common sense

Joe, of course, can simply climb back aboard his vehicle and by traveling about in space, keep young and outlive his great grandchildren.

This 'Time Dilation' is certainly a startling idea—accepted with great reluctance by some, and not at all by others. Since Einstein's clock paradox is so contrary to common sense, even with formulae to prove it, a debate still goes on.

Indisputable proof of this idea is expected when an atomically operated clock is launched into space next year and compared with a synchronized mate on Earth. Signals telemetered from EGO will give an accurate reading as the minutes and hours are ticked off. Comparison with the duplicate earth clock will be logged electronically, with no

chance of error. Special clocks are now being created for this test by the National Aeronautics and Space Administration.

Our clocks are set by twenty-four hour rotation of the Earth. We select a star in the sky and record the time a point on this planet passes under it on successive nights. Fluctuations and wobbles in the Earth's rotation, however, cause irregularities that must be corrected mathematically.

The clock on your kitchen wall is accurate enough for you to know when to turn on the radio for the morning news. It is regulated by the electric current coming into your house, and a few seconds' error isn't important. The announcer's clock in the studio is a little more accurate than yours, since the announcements he reads are sold by the second—ten, thirty or sixty second commercials.

At a race track officials clock the horses to a tenth of a second. While this is fairly close timing, it isn't good enough for modern technologies. They demand measurements to the millionth of a second. Only with such precision will Einstein's time paradox be proved satisfactorily to the doubters.

Laboratory chronometers can achieve great accuracy, but even these possess minute errors. A clock regulated by the motion of atoms, however, can be very precise. The spinning of an electron in an atom is pure and regular, fixed by the laws of the atomic world. An electron, therefore, can serve as an exact pendulum to control the synchronous motor of an electric clock.

Such atomic clocks have already been built—by the National Physical Laboratory in England, the National Bureau of Standards in the United States, and private concerns. Operated by the atoms of Cesium, the silvery metal used to coat the screen of your TV set, these clocks are so accurate they will lose only one second in a hundred years. They are much too large, however, to be crammed inside a rocket's nose cone.

## Clocks for nose cones

Right now the National Bureau of Standards is readying miniature versions of this type of clock for NASA. They will operate not only with fantastic precision, but will withstand tremendous blastoff vibrations when hurled into space.

Einstein's Time Dilation theory was responsible for a revolution in mathematics when it was first proposed. Time had always been considered the same for everyone, anywhere in the universe. Einstein's theory shattered the beliefs of many scientists when he showed this wasn't true. He proved, with the logic of numbers, that time was different for observers at different positions.

The mathematics of plane geometry and trigonometry contained all the known laws of two dimensions. Gradually these were extended to three dimensions, to include spherical trigonometry and solid geometry. The scholars felt they had it

made. Then, Einstein threw them his new measurement. Since the known systems couldn't cope with the additional factor of time, an entirely new branch of mathematics had to be developed to include it. It's called tensor calculus, and with it, the world's great brains have tossed the clock paradox clear around the globe. Experts from every country have gotten into the act. And all of them are holding their collective breaths for the launch of the Atomic Clock.

Einstein himself had a simple explanation for the time effect. "If you are waiting on a corner for your best girl," he said, "ten minutes seem like an hour. But if you're parked in the moonlight with her, an hour seems like ten minutes."

### Time and the astronauts

Startling effects may result from our ventures into time. How will we here on Earth be affected—and our astronauts on their future journeys to the stars?

Only time will tell.

*Will the cupboard be bare?*

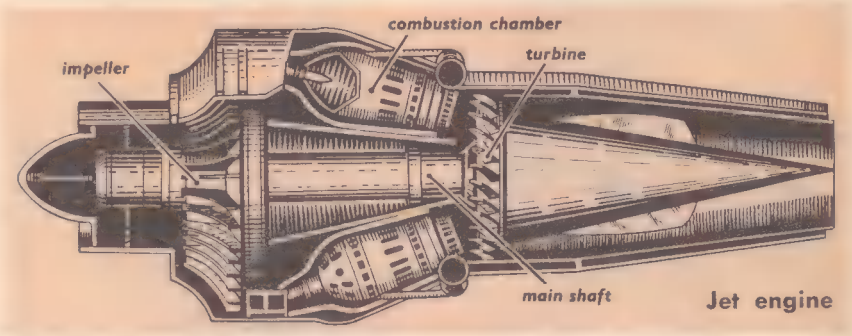
The world population today is over three billion. By 1979 it is expected to hit four billion and by the year 2000, six billion. How can we feed twice today's population when, according to the United Nations, Food and Agricultural Organization, half the world already suffers from malnutrition?

The British historian, Arnold J. Toynbee, doesn't think we can. "Science cannot increase our food supply *ad infinitum*," he told the recent F.A.O. World Food Congress. Another problem is shifting the crop surpluses in one country to the people starving in another. "This cannot be done without political cooperation on a world-wide scale," Dr. Toynbee said. "In the long run the campaign cannot be won unless the planet's hundreds of millions of wives and husbands voluntarily decide to regulate the number of human births."

Professor Daniel Bovet, Italian winner of the 1957 Nobel Prize in Physiology and Medicine, was more optimistic. He pointed out that each year man uses only one ten-thousandth of the organic matter theoretically available. The sea could provide as much protein as the land, he said, but while it covers 71.7 percent of the earth's surface, it supplies only 1.5 percent of man's food.

However, for everyone to get as much protein as Westerners, we would need to raise ten times as much meat and produce three times as much milk and cereals.

Instead, he suggested, man could make synthetic protein from petroleum oil 2500 times faster than by raising animals. By fermenting less than one thousandth of the annual world crude oil output, man could make 7,000,000 tons of vitamin-protein concentrate—enough to make up the present deficiency.




In a jet engine, gases are ignited and escape from an exhaust duct at a speed great enough to cause the entire engine to recoil in the opposite direction.

# Engines: What makes them run?

ENGINES are devices to supply power to work machines. The power is generally obtained from heat, and the heat from burning fuel, although there are two important exceptions to this. One is the atomic power plant. Atomic power plants make use of heat, but the heat is derived from the splitting of atoms rather than the burning of fuel. The other exception is the water wheel, turned by the power of falling water. Water wheels once powered many mills. Today, they turn the generators in hydroelectric plants.

Heat engines are either internal- or external-combustion engines, depending on whether the fuel is burned inside or outside the working parts of the engine. A steam engine is an example of an external-combustion engine, as the fuel is burned under a boiler separate from the engine itself. Gasoline and diesel engines are internal-combustion engines. So is the gas turbine used in jet-prop and jet planes.

In the turbine the jet of steam is made to blow around a set of vanes, just as the wind blows windmills around. In practice, there are several hundred small vanes attached to the surface of a drum, the whole being contained in a close-fitting

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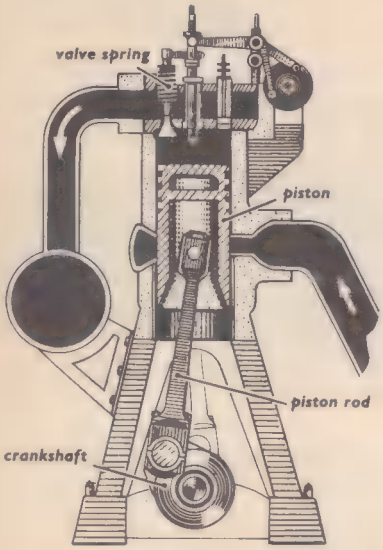



**Diesel engine**

The diesel engine is able to use light oil instead of gasoline as a fuel, and the fuel is ignited by compression, not a spark.

case. The steam enters at one end of the case and is forced to blow the vanes around before it can escape.

In the reciprocating engine the steam forces a piston along a cylinder, just as gas will force the cork out of a soda bottle. The piston is connected by a rod to a crank which turns a flywheel.

When the piston travels to the end of the cylinder, two valves come into operation. One cuts off the supply of steam and the other allows the steam already in the cylinder to escape. This enables the flywheel to go on turning and push the piston back to the bottom of the cylinder again. The valve controlling the supply of steam now opens once more, and the escape valve closes, and so the operation is repeated.

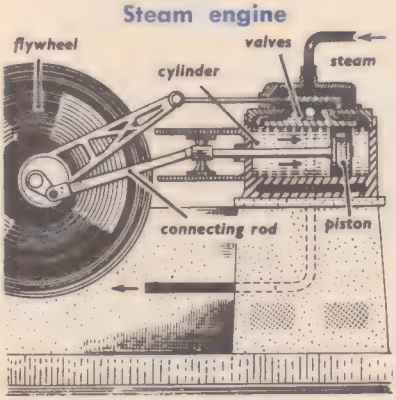
The ordinary internal-combustion engine works in the same way as the reciprocating steam engine, except that the steam is replaced by the hot gases from rapidly burning gasoline. As the combustion of the gasoline takes place inside the cylinder, this type of engine needs no boiler and furnace, but the working of the engine itself is a little more complicated.

You will remember that the power of the steam engine lay in the enormous volume of steam produced by a small quantity of water, and so you can think of the water as a lot of steam compressed into a very small space. In the internal-combustion engine the gasoline vapor has to be compressed artificially into a small volume before it can expand. This is done in the cylinder by a special "compression stroke" of the piston. But if the vapor were simply compressed and then allowed to expand again, nothing would be gained, so when it has been squeezed it is ignited. Then the heat and force of the explosion drives the piston forward with enough force to do useful work, as well as to squeeze the next charge of gas for the next ignition.

To produce an explosion, the gasoline fuel vapor must be mixed with air, and in the very first stroke of the engine the piston travels down the cylinder and sucks in a mixture of air and gas. The air is mixed

with the gas on its way in by means of a carburetor. The intake valve is then closed and the mixture is compressed by the piston returning to the top of the cylinder. At this point the mixture is exploded by an electric spark, produced by a magneto or a battery and coil. The explosion blows the piston down again on the "power stroke."

An exhaust valve then opens and on its return the piston pushes out




The advantage of a steam engine is in the enormous volume of steam that can be produced by a small quantity of water.

all the waste gases. It is then ready to draw in another gasoline and air charge.

The diesel engine, which is named for its inventor, Rudolf Diesel, works in very much the same way except that a light oil is used as fuel instead of gasoline, and the fuel is ignited by compression instead of a spark.

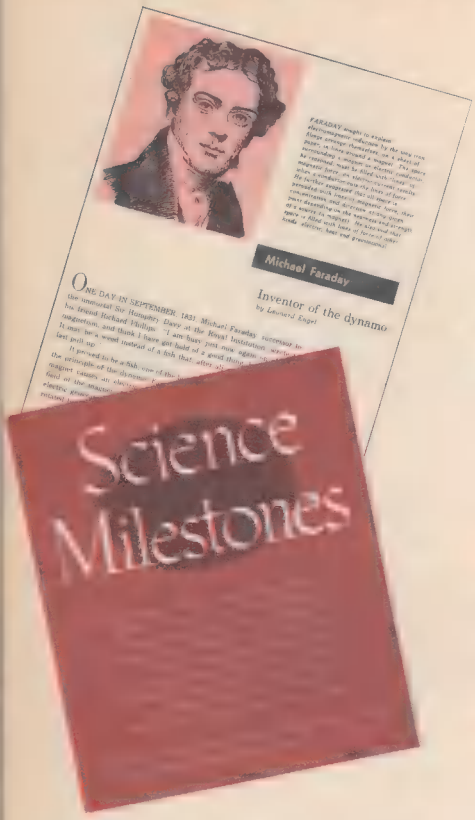
Since the oil is too heavy to vaporize, it is sprayed into the cylinder by a "fuel injector" that works very much like a perfume atomizer. The fuel-and-air mixture is then compressed to double the compression of the usual gasoline engine. This generates enough heat to fire the fuel without an electric spark. Because of their high compression, diesel engines must be more heavily built than gasoline engines. But diesel oil is cheaper than gasoline. So diesel engines are widely used in trucks, buses, railroad locomotives, ships and small electric power plants.

In the gas turbine, air and fuel are forced into a combustion chamber by a fan and are there ignited. The heat of the combustion causes the gases to expand and they force their way out through small vanes as in a steam turbine. If only a very small turbine is used, just powerful enough to drive the fan, the gases escape from the exhaust duct at a very great speed. This causes the whole engine to recoil in the opposite direction and so motion is achieved without the use of power-driven wheels. This is a "jet engine." But the gas turbine may also be geared to turn an airplane propeller. In that case, the plane will be a jet-prop instead of a jet.

Rocket engines are also heat engines but of a very special type.

In the United States, pedestrians between the ages of 45 and 64 are killed in traffic accidents twice as frequently as those in the 25- to 44-year-old group.

# AGAIN—FOR JUST $4.95




## *Science Milestones*

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# What kids say about rockets

by Harold Dunn

**How to get through
the earth's gravy,
why rockets get high,
why an artificial satellite
is pretty spooky,
and what holds the sun's rays up.**

*"The first rocket to be shot from earth had three Injuns in it."*

DID you know that the first rocket to be shot from the earth had three Injuns in it? That a jet plane has an airplane mother and a rocket father? Or that the rocket's cone is not for eating but for pointing with?

This information has come to me in test papers and essays during the eight years that I've taught grade school youngsters. Some of the kids' comments about rocketry are hilarious, and all are expressed in that delightfully original style of children.

For example:

"When you add fuels and oxidizers together, you get BOOMs."

"The difference between a rocket and a missile is that a missile is an air borne rocket while a rocket is a ground borne missile."

One lad was going great—up to the last word: "Before a rocket can get into space, it must get through the earth's gravy."

I get a dizzy feeling every time I read one little girl's sentence: "Of course rockets make a lot of racket, but they are not called rackets because who ever heard of playing tennis with them?"

The kids may not always be right, but they're always ready to venture an opinion about rockets:

"When the fuel gets burning, the gases rush out at the nozzel. So would you if you were in there."

"Liquid fuel rockets will not go unless they have both a fuel tank and an oxidizer tank. And don't forget the match."

"While people wear noses, rockets prefer to wear cones."

"To make sure that the scientists return the rockets safely, the government often sticks the scientists' payload in the rocket."

"Saddlelights are seats to sit yourself inside the rocket."

"The fuel tank is to burn when you want to go up and the nozzel is to spray water on it when you want to come back down."

"A rocket has no moving parts. Except itself. Straight up."

"Scientists put fins on rockets in case they come down in water."

Nobody could ever make a mistake sound like a fact as well as a nine-year-old chap in my class a couple of years ago. Here is some of his logic from an essay entitled, "Rocket Fuel Types for Our Rockets":

"Liquid fuel is to make the rocket land in the ocean."

"Oxygen is for burning or breathing depending on whether you are rockets or people."

"Rocket fuel has a great deal of alcohol in it. They get quite high, you know."

One young lady started out with a misunderstanding and ended up in the pastry shop: "Solid fuel for rockets come in rolls and cakes. Moldy kinds make them explode."

Here are three more observations about rocket fuel that start out quite sensibly:

*"Saddlelights are seats to sit yourself inside the rocket."*

"In order to go straight, the rocket fuel must burn even. Even what is a military secret."

"Solid fueled rockets can be stored for a long time when they can ever find a store big enough."

"Solid fuel is best set on fire by a plug of the sparking type."

The double meaning of words has thrown many earnest grade school scholars off the orbital track. Take a group of children and mix them with words such as "powder," "current," and "body" and you get the following results:

"Powder is for exploding when it isn't for wearing on ladies' faces."

"Current electricity is electricity that is currently living."

"An orbit is the path of a body in space that is under the pull of

another body. It's all pretty spooky."

Here are three more wild guessers at work:

"An artificial satellite is one that isn't really up there. We just think it is from firing it and seeing and hearing it up there."

"A metallurgist is one who is allergic to metals."

"A radio telescope is a thing you can hear programs by looking through."

Much of the juvenalia that I've collected through the years has been devoted to an explanation of the action-reaction principle. When force is exerted in one direction, the rocket travels in the other. Or, as two fifth graders put it:

***"Scientists put fins on rockets in case they come down in the water."***

"Anytime there is a force pushing one way, there is another pulling the other way. Only rockets can understand this well enough to make it work for them."

"The rocket trying to get up in the air is the action and the rocket blowing up is the reaction."

By referring to balloons, here's the way a couple of their classmates don't explain it:

"Get a balloon. Blow it up. Let it go through the air. Wow, because now you understand about rockets."

"One of the main things we have learned through rocket research is why blown balloons act that way."

Once I explained that, with the aid of their telescopes, astronomers are able to learn a great deal about stars and planets that are too small to be seen with the naked eye. So how did it come out in a test paper the next day? "Astronomers study naked eyes."

One young fellow didn't understand an explanation, but he was quite capable of making up one that he did understand: "When we look at some stars, we are actually seeing how they looked millions of years ago. The reason for this is because they can't tell us how they look today. They have no newspapers, you see."

Here are some additional astronomical facts and explanations fresh from the minds of four ten-year-olds:

"The moon is a planet just like the earth only deader."

"Light years are how long it would take to get to a star if you

*"Radiation belts help hold the sun's rays up."*

just traveled in the daytime. We don't hear of dark years because who wants to travel in the dark?"

"Radiation belts help hold the sun's rays up."

"The two main creatures of outer space are particles and vacuums."

There is usually at least an element of truth in the kids' answers. Sometimes they aren't wrong at all; it's just the way they put it that's so funny: "Some space is found in holes. But most of it prefers high living."

"Air is for breathing while atmosphere is for talking about," was one comment.

"Atmosphere is a higher quality name for air."

"The atmosphere is a blanket when it isn't a gas."

No one looks to the future as eagerly as youngsters do. "Rockets will be used to carry letters and male." She went on to explain that, "Letters are what women write each other while male is what men write each other."

"Even better rockets are soon to be found. Where they are to be found is in the future tense," explained one youngster.

"Only two great problems yet remain in our conquest of space. They are getting there and getting back."

Finally, here's a philosophical comment about rocket travel and life in general: "The most important thing about going to any planet or doing anything is knowing when you are there and through and stopping."

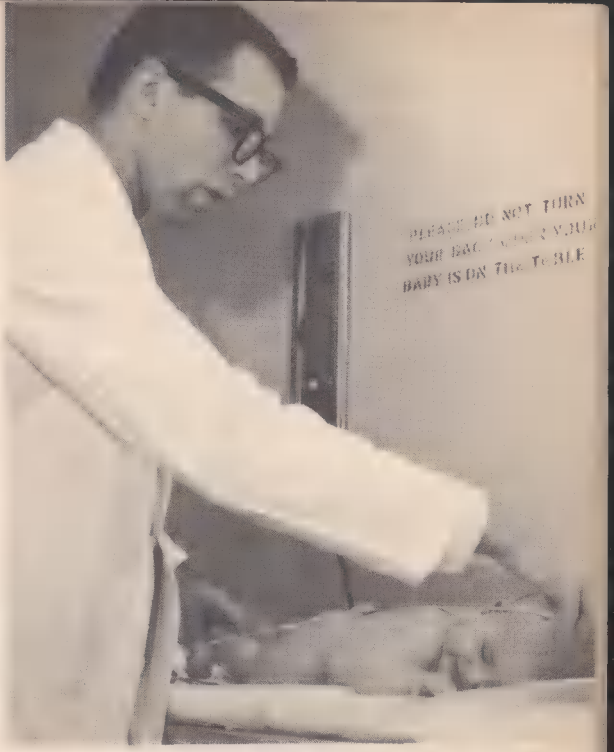
Okay. I can take a hint.

★ ★ ★

### *Man or monkey—where to draw the line*

A group of Tanganyikan chimpanzees has made monkeys out of men by making tools, which only men were supposed to do. Jane Morris-Goodal, a Cambridge University anthropologist, found the chimps using saliva-tipped sticks to catch termites which they like to snack on.

Thus many prehistoric toolmakers previously called men now look merely like smart monkeys. To rate the title of man, each will now have to meet a new five-part set of qualifications devised by a panel of twenty-six scientists. A mammal must be able to stand upright at all times, have a large brain compared to face and body, as skull set nearly vertical on the neck, relatively small cheekbones and hands able to make tools of a recognizable culture.




National Foundation, March of Dimes

# New hope in the fight against DEFORMED BIRTHS

**by Orlando J. Miller, M.D. and Jack Ryan**

A FERTILIZED human cell smaller than the dot over this "i" and weighing one twenty-millionth of an ounce splits and makes itself two cells. These cells split into four. On and on, human cells multiply until a baby is born weighing seven or eight pounds—and containing 5 trillion cells.

But occasionally—about once in every 16 births—something goes wrong. Defective cells are produced —and reproduced. The baby is born with a visible defect, a clubfoot or, worse, an unseen imbalance in chemical-producing organs. He may die of this defect—34,000 do a year. Or he, along with 125,000 such infants born each year, may go through life seriously handicapped.

The thalidomide tragedies, in which drugs taken early in pregnancy resulted in the birth of deformed children, concentrated the public's attention on this medical problem as never before. Yet it is a timeless one and an immense one.

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Only accidents cause more disability among children, although compared with a generation ago many deformed infants now have a good chance at normal life, and there are hopes, some immediate and some distant, of finding even further solutions to childhood's major medical problem.

Consider the cleft palate (when the two halves of the upper jaw fail to close). Two New Jersey doctors, Lyon P. Strean and Lyndon A. Peer, made a study of mothers of cleft-palate children. Most of the mothers had suffered some illness or emotional disturbance, and in each case at a stage of pregnancy when the palate forms. Could these stresses have caused the mothers' adrenal gland to produce extra hydrocortisone which, in turn, retarded normal formation of the baby's palate?

The doctors injected female mice with cortisone and other agents in heavy dosage. The mice produced offsprings with cleft palates. In the next experiment, the same agents were introduced into the female mice—but while the offsprings' palates were forming, the mice also received vitamins B6, B12, and C. This time, no cleft palates. Had the vitamins countered the original agents? If so, would it be practical to give these vitamins to an expectant mother who suffers illness at a stage of pregnancy when the palate forms?

No preventive has come out of this experiment, but it shows the direction research is taking in trying to learn what causes abnormalities and how to reduce them.

This is important because we are not sure how permanent corrective surgery is. The child whose cleft-palate is corrected surgically probably will have no future trouble. But what of the baby whose heart did not develop properly?

Until 20 years ago, he faced death or incapacitation. Then Dr. Robert Gross performed an operation on an infant's heart, closing off a malformed duct that was shunting blood from its normal circulatory route. From that pioneering effort, surgeons have advanced until they now probe the heart itself, mending nature's mistakes while machines take over the job of circulating blood.

But if the heart had developed correctly, there would be less question of its enduring in adolescence and adulthood. Was this an inherited defect? Or did some agent thwart nature—a drug the mother took, something awry in her body chemistry, or a virus infection?

In 60 percent of the cases, we don't know what caused the anomalies, although scientists believe most congenital defects result from a combination of causes. Are parents largely to blame for the defects? Sometimes they think so,

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Dr. Orlando J. Miller is assistant professor of obstetrics and gynecology and lecturer in genetics, Columbia-Presbyterian Medical Center, New York. Jack Ryan is a staff writer for *Family Weekly*.

**We know that at least one virus can adversely influence development of the embryo and may lead to abortion.**

yet there is little scientific basis for this feeling. Only 20 percent of abnormalities have been traced to inherited factors. Ten percent probably come from chromosome aberrations (a breakdown of the chromosome, which helps pass on parents' characteristics, by nongenetic causes —radiation would be one example), and another 10 percent from virus infection.

### How to reduce the risk

Initial research has provided young women with a guide for reducing the risk of bearing deformed children. Abnormalities develop in the first three months of pregnancy, with the first six weeks most vital, so obviously a woman should be under a doctor's care as early in pregnancy as possible.

She will be advised to avoid such risks as X rays of the pelvic region, certain drugs, and high altitudes. Some doctors may suggest immunization against influenza because we know that at least one virus can adversely influence development of the embryo and may lead to abortion. In 1941, Dr. N. M. Gregg of Australia first proved that German measles, contracted during the first three months of pregnancy, produces heart malformations, cataracts, deafness, and other defects in the child.

Despite such evidence, doctors could do little but warn expectant mothers of the risk of infection. Perhaps they will do more in the future. Just last year American scientists succeeded in isolating the elusive virus that causes German measles. Evidence indicates that 90 percent of those infected develop neutralizing antibodies to the virus. There is a tremendous amount of work to be done on this development, but some hope is offered for a vaccine which would immunize child-bearing women against German measles.

Are there other anomaly-producing viruses? Last year Australian doctors found indications that mongolism, a type of mental retardation, may be caused by a virus in the mother. For 16 years they kept records of mongoloid births, and the pattern typified those associated with viral epidemics. Mongoloid births clustered more in urban areas where there is more personal contact, and they increased in number at certain times—one Melbourne suburb averaged one or two mongoloids a year, then in 1944 seven were born in seven months, four in

**"In recent research, man has moved closer to the core of the mystery of life than through all the centuries that lie behind him . . ."**

the same week and living within a quarter-mile area. Fifteen years later, five mongoloids were born in the same suburb within a half-block area. This is no more than a beginning, of course, but if borne out by other studies, we could hope to isolate the harmful virus some day, then try to develop an "antimongoloid vaccine."

*(Medical researchers now recognize that mongolism is due to abnormalities in the human chromosomes—that part of the cell composed of genes which transmit hereditary traits. What causes these abnormalities is still unknown. But a new and still expensive laboratory technique, known as chromosome analysis, can be used to predict the chances of parents having a mongoloid child and shed light on a number of other birth disorders—Editor)*

Among the metabolic disorders which can be treated is pseudohermaphroditism. This produces the carnival's "half man, half woman" or "bearded lady"; more commonly, female infants with this condition are reared as boys, despite their physical inadequacy. Ordinarily, the pituitary and adrenal glands work in conjunction to maintain hormone balance. When the adrenal gland fails, however, an excess of male hormones results. If the baby is female, she will grow up with bass voice, beard—in other words, with male characteristics so pronounced her life will be a freakish nightmare. It is avertable now because, having learned what went wrong, we can inject adrenal hormones into the infant and do what nature has not. Surgery corrects any physical malformation, and there are now cases where girls afflicted with this disorder have grown up normally and have even had normal children of their own.

## The mystery of DNA

What causes organs and glands to go wrong? One theory brings us to the foundation of all living things—the nucleic acids DNA (deoxribonucleic acid) and RNA (ribonucleic acid) which brought 1962 Nobel Prizes to the three scientists who discovered their molecular structures.

DNA is believed to contain the "code" which tells cells how to multiply, whether into bone, fingernail, or muscle; RNA takes the messages and generates the conversion of chemicals to living protein.

Before such theories can be

proved, and before we can hope to control our heredity, we must be able to read the code within DNA. Already two U.S. doctors, J. Heinrich Matthaei and Marshall W. Nirenberg, have taken the first step by reading one code word—the instruction for making the important amino acid, phenylalanine.

### Correcting the human cell

Further knowledge of DNA also has led a scientific team to correct the heredity of an imperfect human cell for the first time. Drs. Waclaw and Elizabeth Szybalski of the University of Wisconsin took bone marrow which failed to make a necessary enzyme; when the cell split, it produced other flawed cells. The doctors fed the flawed cell perfect DNA. When the cell multiplied this time, it passed on a cell with a perfect DNA code for further development.

The late Dr. Thomas M. Rivers, medical director of the National Foundation, March of Dimes, which also is carrying on extensive research on birth defects, put our hopes this way:

"In recent research, man has moved closer to the core of the mystery of life than through all the centuries that lie behind him. . . . It is not too much to expect that some day man will manipulate the nucleic acid in the cells of intact living bodies. When he can do that, he can determine, to some degree as yet immeasurable, what kind of human beings will inhabit the earth."

This is the ultimate dream, of course, and a far-off one. But it is coming closer.



*What makes the ouch?*

SNAKE bites and bee stings are helping to explain pain. From his own and others' studies of venom, Professor C. A. Keele of the Department of Pharmacology at the Middlesex, England, Hospital Medical School has learned that the pain-exciting ingredients in many venoms are common chemicals found in the healthy bodies of a wide variety of animals, including man. He suggests, in an article in *New Scientist*, that the venom glands of wasps, hornets, bees and some other animals may collect chemicals found elsewhere in their bodies. These same chemicals, like histamines, 5-HT and kinins, are in normal man. Yet a concentrated stinger full of them can cause a lot of pain.

Other venoms act indirectly. The venom of the Malayan sea-snake, for example, breaks down the cell walls of skeletal muscle (as in arms and legs), releasing the potassium inside. The potassium causes the pain. It is a normal body chemical.

Cases like these make Dr. Keele suspect that chemicals normally in our bodies cause the pain of diseases and injury when they become too concentrated in the wrong places.

# INVENTIONS PATENTS PROCESSES

## Braille by computer

A solution to the tedious problem of transcribing books into Braille for the blind may be just around the corner. Up to now it has taken as much as six months for a volunteer worker to transcribe a single copy of a book. Now Wade White, a graduate of the University of California at Berkeley, has developed a technique for producing Braille texts with a high-speed electronic computer and a code-operated Braille printer. White, who was an electrical engineering student, devised and tested the system as a class project.

Under the new system, the English text would first be converted to punch cards, a standard operation on a machine that uses a two-digit numerical system. Then a large computer, following pre-set instructions, converts the English text code to Braille code on a second set of punch cards or on magnetic or paper tape. After the Braille code is proofread and corrected, it is then inserted through a small com-

## Inventor of

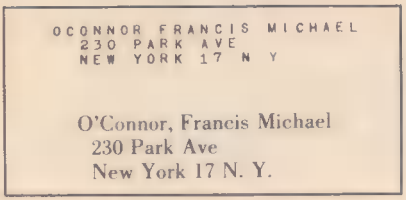
Arthur North, cited by Science Digest this month for inventing a system of teaching computers to capitalize and punctuate, is a man who cannot own a patent.

ARTHUR NORTH is named Science Digest Inventor of the Month for teaching a computer to capitalize and punctuate. His system is a step in a new automated printing process that is expected to save the government millions of dollars.

Although grateful to him, the Patent Office is prohibited by law from giving him a patent. He is a digital computer systems analyst on its staff, and employees are denied patent ownership. His invention is in the public domain, which means that anyone may use it.

The first book to be printed by the new system is a directory called *The Roster of Attorneys and Agents Registered to Practice Before the U.S. Patent Office*. The raw material, consisting of the names, addresses and connections of the 8,000 persons, all set in capitals and numerals with-

# he month




North's invention now enables computers, which used to write as in the top sample, to produce the good-looking type shown at the bottom.

out punctuation, is on 30,000 punch cards.

Earlier editions had been produced by running the cards through a machine that printed them just as they were. The result was unattractive and hard to read, and the capitals took a lot of space.

North made a first magnetic tape from the cards. Before feeding it through a computer, he wiped the computer's memory clean. The memory consists of 70,000 iron doughnuts the size of pinheads, set in 10,000 positions. Another preliminary step was to feed into the computer North's "program," a set of 300 instructions punched on 100 cards.

When the first magnetic tape was run through, the machine had been told to capitalize the first letter in each group, where to put periods, commas, apostrophes and asterisks, and even when to use ligatures—two or more letters joined, as fi and ffl. The computer turned out a second magnetic tape with lower case and punctuation.

From the second magnetic tape, the Government Printing Office produced a punched paper tape that operated its phototypesetting equipment. The printed result used tall and narrow letters that were easier to read and were set in four columns instead of three, greatly increasing the listings per page.

The first magnetic tape is being kept by the Patent Office to be corrected for future editions of the directory. The Department of Commerce, parent of the Patent Office, expects to use the system in publications totaling 20,000 pages a year. Other government agencies will follow suit.

North expects to add refinements to his computer program. One will explain to the machine that *a* is not to be capitalized when it is followed by *nd*. If a Mr. And ever registers, his name will have to be spelled out by an operator. Machines remember, but they don't think.

A wartime cryptanalyst for military intelligence, North joined the Patent Office from private industry. When he was appointed, he had to give away his interest in a pending patent. —*Stacy V. Jones*

puter or transcribing device to actuate an electrically-operated Braille printer, producing a page of raised-dot Braille text every three minutes. White believes that improvements can cut this time to two minutes.

With computing service available from a large computer center, White believes the small transcriber and automatic printer needed to begin operation might be obtained for as little as $2,000.

A round-trip ticket on this aircraft might cost you as little as $25,000. This is a Lockheed artist's conception of a passenger shuttle between earth and a space station which could, in theory, be operating within ten years.

### *Special, low fare: $25,000*

We could be running a 10-passenger cargo carrier between earth and an orbiting space station ten years from now if we wanted to, according to a Lockheed-California Company study for the National Aeronautics and Space Administration.

The price for a round-trip ticket on this shuttle? A mere $25,000 to $50,000 after a four-year initial operating period. This would be based on 16 round trips per month to a station in low earth orbit. Of course, such passenger service is theoretical and Lockheed is quick to point out that no approval of such a project is around the corner.

The initial study report, done by Lockheed for NASA's Marshall Space Flight Center, recommends a winged craft with three recoverable stages to reduce expense. Such a craft could take off horizontally and make aircraft-type landings on return to earth. The spacecraft would have two or three "nested" stages. The first would be turbojet-powered for atmospheric return to home base. The second stage and the passenger carrier (the third stage) would be glide vehicles.

### 'Pocket-sized' rocket

A five-foot-long rocket motor that packs a 2,000-pound thrust, the JUDI serves as a high-altitude meteorological research and day-to-day weather measurement tool. It is powerful enough to boost a 10-pound payload to altitudes well above 250,000 feet (more than 40 miles). Fitted to it is a slim, three and one-half foot long metal DART which can house payloads ranging from gigantic balloons to millions of tiny metal particles, as needed for probes of the upper atmosphere. Its manufacturer, Rocket Power, Inc., Mesa, Ariz., a subsidiary of Mare-

JUDI midget rockets can travel 40 miles up with a 10-pound payload. They are currently being used for weather studies and general meteorological research.

mont Corp., Chicago, has designed it with an eye to economy; half a dozen of the vehicles cost less than the average new car.

## for the home

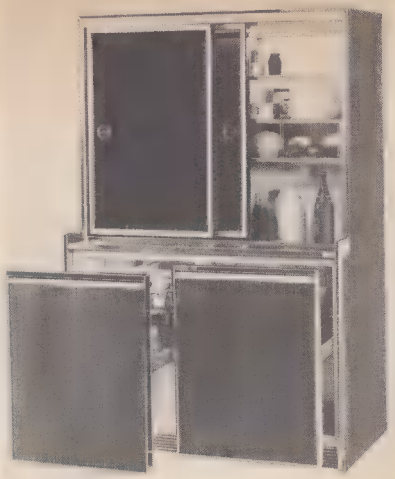
### 'Furniture' look for refrigerator . . .

Furniture styling is the unusual feature of the Avanti refrigerator manufactured by the Franklin Appliance Division of Studebaker Corp., 65-22nd Ave., N.E., Minneapolis, Minn. It comes in a choice of American walnut, English brown oak, clear birch or painted exterior panels. It can be incorporated into the home as a free-standing furniture unit, or can be built in. The upper refrigerator section has transparent, insulated sliding glass doors.

Other features are slide-out twin freezer compartments, vegetable crisper, meat keeper and egg compartment, automatic defrost, automatic ice-cube maker and storage, and ice-cream and frozen-juice compartment.

### . . . and range

A walnut base and handles help make Waring Products Corp.'s new portable range suitable for dinner table or patio buffet. The top of the range is Warex porcelain on steel, and each of the two tubular heating elements has its own thermostatic control. Waring Products is located at 25 West 43rd St., New York 36, N.Y.



Avanti refrigerator looks more like a piece of furniture than a standard appliance; it comes in a choice of walnut, oak, birch, or painted panels.

### For inveterate party givers

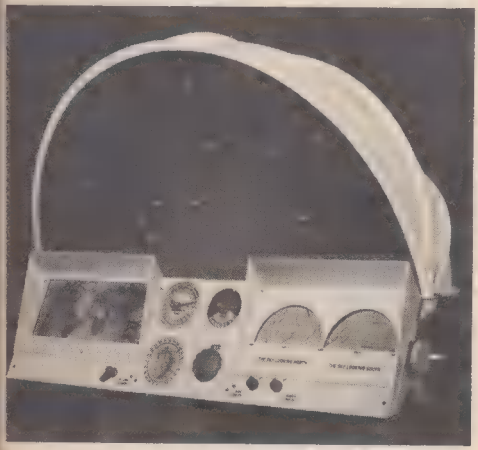
An ice cube maker that can turn out forty pounds of ice cubes a day has been offered by Acme-National Refrigeration Co., Inc., 19-26 Hazen Street, Astoria 5, N.Y. It is 24½ inches high, 14½ inches wide, and 15½ inches deep. The cabinet comes in grained steel or vinyl-clad steel.

### Name tapes without sewing

Name tapes which can be ironed on without the trouble of sewing are available from The Lighthouse Inc., Dept. 81, Brockton, Mass. They can be affixed to clothing with the heat of an iron, or they can be sewed on.

# Science toys

Life in a community of bees can be observed in the classroom with this new teaching aid called the Bee Colony. It consists of two hives and has a tube to allow the bees to leave the hives.



The Cosmorama, a miniature planetarium, projects 29 constellations, can achieve a full 24-hour cycle. It shows cloud effects and sunshine as well.

## No privacy for bees

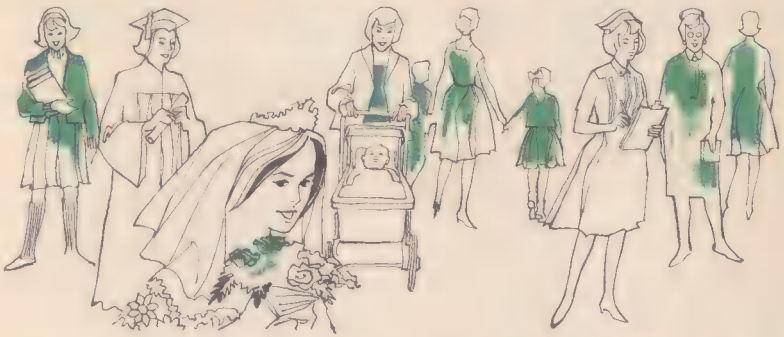
The Bee Colony is a new teaching tool designed to give science students a glimpse of day-to-day life in an actual community of bees. It is a product of the E. H. Sheldon Equipment Co., Muskegon, Mich. The Colony consists of two hives of standard comb foundations, connected to each other by "bee gates." A dial control system regulates the movement of the bees between the honey-producing hive and the breeding hive. A clear plastic tube installed through the sash of a window allows the bees to leave the Colony for the outside world. During bad weather, they can get food through a feeder bottle containing sugar solution.

## *The stars in your home*

The Cosmorama, a miniature planetarium assembly kit, projects 29 constellations, including 159 stars, on a 26-inch dome. It is manufactured by Renewal Products, Inc., Old Country Road, Mineola, N.Y.

The kit features illuminated sky charts synchronized with the star projector and an illuminated map of the earth showing lines of latitude and longitude and time zones. A full 24-hour cycle can be dialed, including sunlight effects and cloud formation for the daytime. The kit operates on three C-type flashlight batteries, and it is recommended by its maker for children ten years old or more.

# Surprising facts about



# WOMEN, WORK, MARRIAGE

As recently as 1940, 15 percent of American women in their early thirties had never married; in 1960, only 7 percent had not.

The great majority of American women marry young and almost all marry at one time or another. Close to 1.6 million will take the trip down the aisle this year.

Marriage marks a major turning point in the lives of these women. What will it mean for them?

For some, it will mean divorce—about 400,000 divorces are granted each year.

For many, it will mean a decision about whether or not to take or keep a job, at marriage or when they become mothers. Over half the women in the labor force are married and over half of these have children under 18.

For most, marriage will mean babies—over four million were born last year—and a decision about how many to have. Married women now in their early thirties are expected to average well over three children each.

These are some of the surprising facts about women, their marriages their children and their jobs, compiled recently by the Population Reference Bureau, Washington, D.C.

The early life of almost every American is largely taken up with education. Today, a girl has educational opportunities equal to those of her brother. In fact, on the national average, women tend to spend slightly more time in school than men.

About 65 percent of all women are married by the time they are 21. As the increase in married stu-

# Women still take jobs early and quit when their first child is born. But a few years later, they are streaming back into the labor force.

dents' housing on many campuses attests, more and more students marry while they are still in school. In 1961, 12 percent of the women in college were married (162,000) and almost half that number (77,000) in high school were married.

A good many women, especially young ones, have children before they are married. One out of every twenty babies today is born out of wedlock. Illegitimacy has been growing alarmingly in recent decades; the rate has tripled since 1940. Although many such births are not reported, it is estimated that there were 89,000 illegitimate children born in 1940, 141,000 in 1950, and 224,000 in 1960.

## Fashions in children

Most women who are married have children. The voluntarily childless couple, like the spinster, seems to be a thing of the past. Although some couples are unable to have a child of their own, they frequently adopt children. And very few couples, these days, choose to have only one child.

But this does not mean that Americans are having the super-large families so popular a century ago. Two-, three-, and four-child families are the preference today.

How does this latest fashion in family size affect the size of the nation's population? If each wife were to have 2.27 babies—a physically preposterous but statistically quite acceptable feat—it is estimated the U.S. population would in a few decades become stationary. But wives now in their early thirties are expected to have an average of 3.4 children by the time they have completed their families!

This excess gives the United States a population that grows faster than that of most other industrialized nations. The 1960 census counted 179 million people. In the three years since, our population has grown to almost 189 million.

The number of children born to wives of various racial, residential and economic groups differs considerably. Among wives in their early thirties in 1960, for instance, white wives had averaged 2.6 children; nonwhite wives, 3.1; urban wives, 2.5; and farm wives, 3.3. Yet each of these groups of young wives had already had more than the 2.27 children needed for a stationary population, and they are far from completing their families.

Among the very youngest wives there are signs of a slight decline in

the number of children to be expected. Wives in their early twenties appear to be heading toward families of 3.1 children. There are indications that early marriage and early parenthood are becoming less popular than they have been in recent years. This may also eventually reduce the size of the average family.

Unhappy lives are thrust upon many children by the high incidence of divorce. In 1960, almost three million children had divorced or separated parents. There are almost two million divorced women in the country; about nine of every 1000 married women are divorced each year. Although our divorce rate now is only about half that of the postwar peak, it remains one of the highest in the world.

### What to do for 40 years!

American women tend to have had their last child by the time they are 28. By 34, with her youngest in school, the mother's full-time child-tending chores are behind her. After her intense activity with a lively brood of youngsters, she is likely to be bored and want something to do during most of the 40 remaining years of life she can expect.

Increasingly, women are filling these years with paying jobs, either full- or part-time. This trend has reached major proportions during the last two decades.

Back in 1890, less than one wife in twenty was in the labor force; in 1950, it was one in five; by 1960, it was one in three. The proportion of wives who are in the labor force has always lagged behind the proportion of unmarried women. Today, the proportions are about the same.

### Working wives with children

The proportion of mothers who work has also increased substantially. A third of all wives are working today, but 42 percent of wives who have children between 6 and 18 are in the labor force.

In 1940, a young woman was just as eager as she is today to take a job, work at it for a few years until she began her family, and then quit. Then, middle-aged and elderly women were unlikely ever to return to work. In each five-year age group over 25, the proportion of women working declined gradually but steadily: from 46 percent of those in their early twenties to 15 percent of those in their early sixties.

By 1960, this age-work pattern had changed radically. Women still took jobs early and quit when their first child was born. But a few years later they were streaming back into the labor force. In each five-year age group the proportion of women working rose: from 35 percent for those in their late twenties to 47 percent for those in their late forties. The proportion tapered off gradually for women in their fifties. Today many continue to work until quite an elderly age:

almost 30 percent of the women 60 to 64 are working, twice the 1940 proportion.

Many working women in their forties and fifties have children in college. The high cost of raising children well—particularly the high cost of education—has made two pay checks a necessity in many families. This may be as important a factor as boredom in the decision to go back to work.

The exact cost of raising a child these days is difficult to determine, but there is no doubt that it has gone up considerably since 1947. That was the peak of the postwar baby boom, when many couples apparently were planning to have three and four children. Since then, the cost of living has gone up more than 35 percent. The cost of sending a student through a public college has risen by 54 percent and through a private college by over 70 percent. In planning their families, young couples with a sense of responsible parenthood face a completely different economic situation today than they did in the rosy immediate postwar years.

### Older women need jobs

Economic problems may be the reason so many elderly women continue to work. Many who outlive their husbands need jobs for income and for greater social security rewards.

"We are building a society which demands special training and many skills—a society which will offer few opportunities for unskilled people in the decades ahead," said the Population Reference Bureau's President, Robert C. Cook. "This might well influence the size of the American family.

### The wisdom of youth

"In today's world, youth sometimes reveals a levelheadedness which surprises its elders. It now appears that young couples plan to have smaller families than those in fashion since 1947. This is sound judgment in view of the high cost of living as well as the changing employment situation. It is also very much in the national interest. During the past 15 years, the rapid increase in numbers has caused economic, educational and social problems for the nation as well as for the family."

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"Glad you could make the scene, man—!"

# Get away from it all?

# Don't!

Did you ever long for a nice, quiet, little place where you could get away from it all? Well, Dr. S. Smith of Lancaster Moor Hospital in England has built just such a place, but he has found that people don't like it too well.

The quiet place is a 9′ x 9′ x 7½′ soundproof cubicle suspended by nylon cords at the top of a large building. The purpose of constructing such a cubicle was to find out what happens to people when they are deprived of all sensory stimulation from the outside world.

Each of those who volunteered to get away from it all was placed into the cubicle with translucent goggles over his eyes to cut out patterned vision. His hands and arms were enclosed in padded fur gauntlets to reduce the sense of touch. Heavy woolen socks reduced sensation in his feet. A one-way screen was fitted into one of the walls of the cubicle so the occupant could be seen but not see out. Meals were eaten in the cubicle.

The volunteers stayed inside as long as they could stand it.

Altogether, 27 volunteers spent varying periods in the cubicle. One of the surprising results was that women could stand the isolation better than men. Anxiety-prone persons gave up first, but no one could escape the effect of disordered thinking. Smokers who were not allowed to smoke had an extra-tough time.

The main difficulty was loss of concentration, sometimes in less than an hour. This would produce unbearable anxiety, or panic attacks, which would cause the volunteer to give up. Some could not take the isolation for more than five hours. One woman endured it for 92 hours.

What did the experiment show? It showed that a continuous sensory input into the brain is necessary for normal thinking, sleep and behavior.

## How coeds and nuns differ

The attitudes of college girls and novice nuns differ as sharply as their ways of life.

Psychological tests show that novice nuns tend to view life in terms of extremes while college girls have more moderate views. The nuns' strong attitudes tend to be uniform while the coeds' views are more variable.

These differences had been suspected but they have been tested and corroborated for the first time in a study by Drs. Melvin Zax and Emory L. Cowen of the University of Rochester, N.Y., and Sister Mary Peter of Catherine McAuley College, Rochester.

## *Neurotics on the golf course*

"The golfer's game becomes a crucial arena for working out conflict, widening ego activity, working through the infantile neurosis, and may become neurotic behavior in itself."

So observes Dr. Carl Adatto of New Orleans. Dr. Adatto, who admitted to being an "active golfer" himself, told fellow analysts at a recent meeting of the American Psychoanalytic Association that his understanding of the game permitted "easier communication on the part of patients who as golfers were more than happy to report the details of their game."

In addition to offering insights into certain patients, golf also sheds some light on the role of play in adult life, which is significant, he said, because "analysts are in danger of accepting the concept that play is permissible only for children."

Drawing on his case histories, he told of a woman threatened by ego disintegration and a fear of a psychotic episode who "tenaciously hung on to her golf game as proof of her psychic mastery during a period of intense external stress." Playing the game proved to her that she was "intact."

Dr. Adatto concluded that the game of golf has a "wide range of intra-psychic meaning to the patient . . . and, while a game may have certain symbolic meanings, there is no single meaning to golf, even within the individual."

## Patients doctors can't treat

Some sick patients are difficult to treat because there is no remedy for their illness, but more frustrating to the physician is the "difficult patient" who can't be treated because he is not ill, says Dr. Jackson A. Smith of Chicago. A doctor can readily pick out a difficult patient because he has medically shopped among many doctors and is dis-

paragingly familiar with most medical techniques. His illness is chronic and his complaints are vague.

In managing the difficult patient, Dr. Smith says, it is important to determine if the patient relies on his illness to avoid unpleasant situations and to escape responsibility. "The patient's motivation in seeking treatment must be established."

Sometimes it is unwise to use medication, Dr. Smith continues, because it may serve to produce "psychological dependence and fixation of the complaint."

### *You faint when you can't run*

The most common form of fainting occurs when a person "experiences a fear he must deny," says Dr. George Engel, professor of psychiatry and associate professor of medicine, University of Rochester.

When a person faints at the sight of blood, when given unexpected bad news, or when taking a routine flu shot, Dr. Engel says, the faint is largely psychological in origin. These faintings have one thing in common: The person is faced with some injury, either actual, threatened or imagined, that frightens him.

Studies conducted by Dr. Engel have shown that, under such circumstances, a person undergoes the same physiological changes that occur when a living creature responds to danger by running away. But there is one important difference: The fainter is in a situation where he cannot run away or take some other appropriate action to protect himself.

"Moreover, the greater the fear and the more blocked the action, whether of fleeing or fighting, the greater are the chances of fainting," the professor says. "By the same token, if a person's attitude toward his situation changes from one of fear and resigned acceptance to one of confidence or even defiance, the likelihood of his fainting decreases."

Men seem to experience this type of fainting more than women—probably because men find it harder to acknowledge the fact that they are afraid, Dr. Engel says.

Another type of fainting, also primarily psychological in nature, he says, is more common in women. Technically termed "hysterical syncope," it is the sort of fainting that occurs among teen-agers who faint in the presence of their singer-idol or among beauty-contest winners who swoon at the announcement of their victory.

Hysterical fainting does not demonstrate the physical changes recorded in fear-caused fainting, Dr. Engel says. It usually has a symbolic meaning for the individual and constitutes a psychological means of attempting to resolve an inner conflict.

# How to grow old without aging

by Albert Parry

## Every one of these

A LOT of people in the southern part of the Soviet Union are living to incredibly advanced ages. Moreover, these remarkable oldsters are not in the last stages of physical decline, but are as alert and healthy as people from other parts of the world who are thirty or forty years younger.

A Russian medical team investigating Soviet Georgia (Stalin's birthplace) reported recently that this relatively small area has 2,100 men aged 100 or more.

Why do these people, most of them from the Caucasus mountains, live so long—doctors have no single answer. But extensive study of these remarkable people has led to some interesting conclusions.

Take the case of Makhmud Bagir Ogly Eivazov, an Azerbaijanian mountaineer of the Northeastern Caucasus.

In 1959 he vowed that he would live to be 200, no less. But soon after this boast, on August 11, 1959, he died, a mere 150 years old.

Makhmud Eivazov had worked at his farm until the very last, and was feeling fine only a few days before his death. He had counted his progeny as consisting of 23 sons and daughters, the last of them born

Sovfoto

In the southern part of the Soviet Union people live a long time; here is a chorus of one-hundred-year-olds from Abkhazia.

## men is over 100

when he was 100; more than 150 grandchildren, great-grandchildren, and great-great-grandchildren—a total of about 175. His eldest daughter was then, in 1959, 120 years of age.

What was the recipe? Steady toil and simple food, he used to say. Also: Bathe in the mountain river every day and sleep outdoors at any time of the year, even in winter. His favorite dishes were meat and milk, and especially buttermilk, which he drank nightly before retiring. Of alcohol he never took a drop.

Lest we think that 150 has been rare or indeed the limit of human life, official Moscow sources cite the following cases:

In Abkhazia, on the Black Sea shores of the Southwestern Caucasus, a mountaineer named Mamsyr Knut was 158 in 1956. A fellow villager and possibly a kinsman, Khapara Knut, died at 155. His funeral was attended by a friend, Adleiba Mazhachva, 150. In Osetia, not far from Stalin's native town, a woman—Telse Abzive—was reported to be 180 when she died.

Also in the Caucasus, in the mountains of Daghestan, Lyubov Puzhak was 156 in 1959. In the Ukraine lived her two brothers—

Luka, 123, and Pallady, 120—and sister Xenia, 114.

From the Kuban and Stavropol regions of the Northern Caucasus two women were reported to have reached 148 years each, and two men 145 years each. One of the latter worked as a cooper, in 1951, even at 145.

In some of the instances, there is no precise documentation of these people's births. The consensus of those medical scientists who have examined these oldsters is that the subjects are indeed over 100, but how far beyond 100 is sometimes difficult to tell.

A friend of mine, Dr. Ivan Basylewicz of Kiev, now in the United States, tells me that before World Was II he was a member of a gerontological team studying whole groups of Caucasian centenarians. His expedition felt that mountains do have something to do with man's longevity: the good oxygen, the high-altitude travel and the hardy toil, the plain but nourishing food, all come with such an area.

Yet plainsmen and shore-dwellers, too, can learn from mountaineers something about breathing even in the places where there is less pure air. Russian doctors now lay down these rules on breathing:

---

Dr. Albert Parry was born in Russia and came to the United States in 1921 where he received his Ph.D. from the University of Chicago. He heads the department of Russian Studies at Colgate University and has written many articles on Soviet affairs for *Science Digest* and other publications.

Not to die before "your normal 100," you should breathe deeply and rhythmically. You thus increase a quantity of inhaled oxygen per unit of time. Proper breathing exercises supply your heart with its "armor" against certain of man's heart diseases, also help the blood flow in the heart muscle itself. And a stout heart is the chief prerequisite of happy longevity.

## Breathe deeply

However, you have to learn this proper breathing—deep and rhythmic—when you are still a child or a youth. And having learned this deep and rhythmic breathing, you should keep it up all your life, well into your old age—which should then become a very ripe yet pleasant age indeed.

On food, Soviet gerontologists attach importance to such eating staples among the long-lived mountaineers as wheat bread, cheese made of sheep's milk, butter, and honey.

Meals among Russia's long-lived mountaineers come at strictly scheduled hours, four to five times a day during work in orchards and fields, and three to four times the rest of the year. Tobacco, like alcohol, is either taboo or used moderately.

Rest and sleep are zealously guarded. A person is not to be awakened except in a dire emergency. He is to have his fill of sleep under any and all circumstances. He is to awake naturally, by himself.

Even if an old man or woman is beyond any working capacity, the family and the community make the old people feel important or at least needed by coming to them for advice. Often such advice is not at all necessary, and before mountaineers grow old they know perfectly well the gimickry of this advice seeking. But when they are old they forget the make-believe quality of it. They now think they and their advice are wanted. The family and the community go through the motions gravely, with not a hint of mockery. And so the old men and women have an incentive as well as the physique to live on and on.

"Man's normal span of life is indeed 100 to 120 years," my friend Dr. Basylewicz has said to me repeatedly. "Right now it is achieved in rare instances only, but I see no reason why it shouldn't be everybody's destiny. Moreover, old age can and should be a happy phase of human life. No matter how old, you needn't be a burden either to yourself or to others. You needn't be sick. You needn't lose your intellectual faculties. You can continue finding pleasure in life even at 100, even at 120!

"We at Kiev were the first doctors to study these 'longetarians' as a group. We traveled to Abkhazia with our books, instruments, and laboratories, and we studied them for a long time. We took, at random, 72 longetarians for our study, among them not only 34 centenarians, 32 men and 2 women of 100 years and older, but also 38 non-

Sovfoto

Gadako Sozanov, of the village of Glagdov in North Ossetia, is 106 years old.

agenarians—14 men and 24 women. It is curious that in Abkhazia, as well as other parts of the world, for one reason or another, none as yet too clearly defined, many more women than men live into the age bracket 70 to 90, but after 90 many more men than women reach the age of 100."

The investigators had expected to find their subjects, particularly the centenarians, barely clinging to life. "Imagine our astonishment at those vivid eyes lighting up the parched skin, at those men's keen memory, clear mentality, and lively interest in their surroundings. We were surprised when we saw their enjoyment of life and even a certain moderate capacity for work."

The expressiveness of the longetarians' faces and the youthfulness of their eyes were especially striking. Exhaustive examinations and

laboratory tests revealed that, out of the 72, only 19 needed any medical attention at all. Only two cases had symptoms of progressive senile psychosis. True, a general decrease of basal metabolic rates was noticed by the doctors, but the group's principal blood constituents were normal. Blood pressure was within normal limits in three-quarters of the cases. Hearts and kidneys were in good order. Many of these people, nearly 100 years old or beyond that borderline, did not seem any older than an average person in his seventies.

## No emotional disturbances

Their skin was like parchment, of course. Their faces were deeply furrowed, and those lively mouths and eyes were hollow and sunken. Their thin bodies were shortened by age, and their muscles sluggish. But they showed no undue tendency to bone fracture.

There were definite compensating factors: while the efficiency of normal breathing was impaired, the amount of oxygen intake by tissues was considerably increased. There were also compensations in the longetarians' nervous system: even though their sensory perception was somewhat weakened, their irritability was lowered. They were not subject to emotional disturbances. They slept with no difficulty. Their appetite was slighter, true, but what they ate they ate with enjoyment.

Their sex life had in most cases long departed, but most of them found pleasure in boasting about their former prowess. A few of the men professed a certain interest in females and some sexual power even at the age of 90 to 100!

All of them had lived close to the soil and this contributed to their longevity. More important, they did not let their farming gnarl their souls. Their work was hard, but they enjoyed it more than city folk usually relish theirs. "Still," Dr. Basylewicz has observed, "if you are a city person and really like your job, you can last longer than a villager who hates his."

Of the 72 longetarians studied, the parents of three-quarters of the group and the grandparents of one-half had lived to a very advanced age. This has led Dr. Basylewicz to say:

"We acquire our attitude to life from the elders of our families more frequently than we realize. As for our physique, we don't inherit diseases but we do inherit certain physical characteristics which may make us more vulnerable to certain ills."

And yet, you can overcome your heredity and rise above your environment if these endanger your chances of happy longevity. Even if you come from nervous, worrying stock you can learn to be calm—by your own sheer effort. And should there be a physical disability seemingly inherent in your family you can fight off its dangers—by early medical attention, by your right living, too, so that both your metabolism and your circulation take you into your good old age.

# Science in the news

Out of the complexity of technical data put forth since the nuclear-test-ban treaty was signed, three facts emerge: 1. The U.S. has more nuclear power than the Soviet Union. 2. We will continue to perfect our nuclear weapons in underground tests. 3. Any Soviet breach of the pact, without our knowledge, will be virtually impossible.

1. Defense Secretary Robert McNamara called our nuclear forces "manifestly superior." We do not have 100-megaton weapons like Russia's, but he said it's better to have "two or three smaller weapons instead of one large one." Critics said the ban would hamper the development of an antiballistic missile system. McNamara countered that it is a series of problems related to hitting the target that will hold up the system. He said ABM warheads won't depend on tests in the atmosphere, which the treaty bans along with space and underwater tests.

2. We're already well along in underground testing. Seventy subterranean blasts have been announced in the past two years. Now

we will step up the underground program still further at the Nevada test site.

3. How will we monitor space for any breach of the ban? With new satellite detectors orbiting up to 60,000 miles from earth and capable of registering the X rays from a nuclear explosion far beyond that (200 million miles in the case of a none-megaton blast). We already have a worldwide system of devices to detect tests in air or water.

Significant space shorts: The U.S. and Russia are exploring the possibility of an understanding on legal questions that will arise in the exploration of space....The belt of "needles"--copper fibers--we placed around the earth in May have proved their worth in teletype communications (without interfering with astronomical observations) ....The Air Force Titan C-3, believed to be the world's largest single-rocket motor, was test-fired on the ground "well ahead of schedule" and without a hitch....Telstar II, the communications satellite, fell silent for three weeks, then came back to life....Dr. George E. Mueller of Space Technology Laboratories was named the new manned-space-flight chief for NASA.

Space money: The House cut $472,000,000 from NASA's budget. The Senate restored half the cut. In both chambers, lawmakers showed clearly they wanted no boondoggling.

The quake that hit the Yugoslav city of Skoplje could have been predicted. A Soviet tremor specialist reported that major earthquakes are preceded by waves which slow down as they go through rock. By correlating changes in velocity with past quake records, according to V.I.Keilis-Borok, a predictive pattern would emerge.

The last known particle of matter has been detected. Scientists from Yale University and Brookhaven National Laboratory found the particle known as anti-Xi-zero, which physicists had figured out mathematically was there all along. It was known that each elementary particle has an opposite, or anti-particle. Xi-zero had already been discovered,so the scientists looked for its "anti." They found it by bombarding protons, in this case liquid hydrogen, with anti-protons from Brookhaven's alternating gradient synchrotron. The known particles of matter now add up to a neat 34--17 elementary particles, each with its anti-particle.

An American and a Russian won the 1963 Atoms for Peace Award. The winners are Edwin M. McMillan, director of UC's Lawrence Radiation Laboratory, and Vladimir I. Veksler of Moscow's Joint Institute for Nuclear Research. They both developed a way to increase the voltage of the electrical pushes given particles in cyclotrons. Result: the synchrotron, new advances (as above).

## Science in the news

Atoms may help slake our thirst. The Atomic Energy Commission has asked a New York Firm of engineers to see if it's practical to take the salt out of sea water in a plant powered by atomic energy. Such a plan may break through the economic barrier of high cost in desalting processes. First place that would benefit: ocean-bound Key West.

What's under the sea? Ocean research got a boost from the White House. Its Office of Science and Technology put out a report by the Interagency Committee on Oceanography. It proposes a ten-year program to add 52 ships to our present fleet of 76. The number of research labs would be raised from 50 to 70, and oceanographic manpower from 2,700 to 6,000. Impetus: Soviet exploration of the sea. Cost: $2.3 billion. Outlook: A cost-paring maybe.

An old science declared its "rebirth." The 16th International Congress of Zoology met in Washington to break away from the trend of many minor disciplines. "Currently we are advancing our knowledge of various fractions of the field; but our concept of the total organism has all but vanished," said Congress President Dr. Alfred S. Romer. "This Congress was conceived as a step toward the reunion of the zoological sciences into a coherent discipline." The public was invited to discussions of how zoologists can help man. One topic: Man's Ability to Control his Biological Destiny.

We're still wary of nuclear fallout, despite the test-ban treaty. The U.S. Public Health Service reported that, in May, our milk had almost twice as much strontium as a year before. And the Interior Department reported sharp rises in the tritium content of water. Official verdict: The higher radioactivity counts are not dangerous.

A birth-control pill suspected of having fatal side effects was cleared by the Food and Drug Administration--with a caution. The pill is Enovid, made by G.D. Searle & Co. It became the subject of a study after a number of women who used it to suppress ovulation developed blood clots, some of them fatally. A panel of nine university scientists found no direct connection, but noted that users over 35 died of blood clots at rates called "highly significant." Doctors are now urged to prescribe the drug for women over 35 with great care. Women with certain ailments, which the manufacturer must list, also should be wary of the drug. Incidental footnote: Over 2 million U.S. women now use oral contraceptives.

QUOTE OF THE MONTH: "Countries that practice death control must also practice birth control or prepare now for a time when their people will have to live standing up because there won't be room to sit or lie down."--Dr. Clement Markert, Johns Hopkins U. professor of biological medicine.

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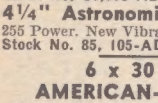

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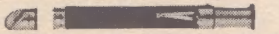

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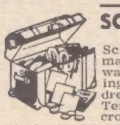

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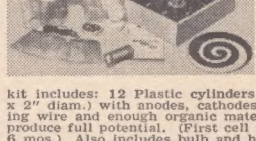
## BIOLOGICAL FUEL CELL AMAZING "BUGG-BATTERY" GENERATES ELECTRICITY WITH BACTERIA.



New Biological Fuel Cell Fascinates science classes and home experimenters. Waste organic material impregnated with bacteria, when fed an activator solution, produces electrical current. Generates approx. 6-volts at 40 milliamps, will operate most 6-volt transistor radios. Easily assembled kit includes: 12 Plastic cylinders (approx. 3¾" high x 2" diam.) with anodes, cathodes, hardware, connecting wire and enough organic material and activator to produce full potential. (First cell is still running after 6 mos.) Also includes hydrometer, demonstration electric motor, switch, whirling disc and instructions.
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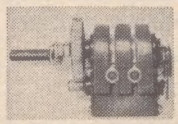

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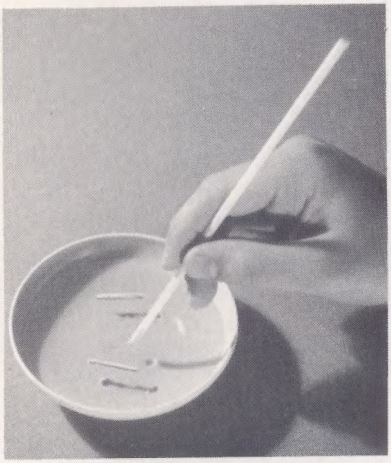
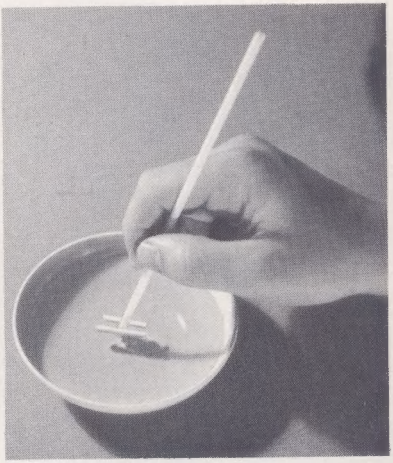
# WATER WAND





THE molecules of all liquids affect each other and try to crowd up. This makes every water surface seem as though it was covered with a tightly stretched skin. Scientists say the water shows surface tension.

When soap dissolves in water, it weakens the surface tension. You can puzzle your friends by showing them an amusing trick that proves this.

Make your magic wand by dipping one end of a soda straw into water and then into granulated sugar, so that some of it clings to the inside of the straw. Wipe off any sugar that sticks to the outside, and let the straw dry. Then dig the other end into a wet bar of soap, so that some of the soap stays in the opening.

Float two pieces of a wooden match stick side by side in some water in a clean dish. Touch the soapy end of the straw to the water between the two matches. They will jump apart suddenly, as if alive.

Then touch the sugary end of your straw to the water surface between the two sticks. This time they will drift toward each other.

The explanation is that the tiny amount of soap that dissolved in the water was enough to weaken the surface. Then normal surface tension on the outer side of each stick was able to jerk it back. When you touched the water with sugar, it soaked up the surface molecules like a sponge, pulling the sticks together.

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**Crystal Photocell, Electronic Amplifier, Relay, large Condensing Lens in Cabinet Mount.** Features automatic "on-or-off" or holding circuit operation. Sensitivity Control. Plug-in Outlet for controlled circuit. Use for alarms, counters, etc. Operates on 115V AC. **A basic unit for many exciting experiments.**

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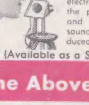

The **TRANSMITTER** consists of a **Light Source,** a **Modulating Reflector Diaphragm** and an Optical Projection System. The **RECEIVER** is a **Two-Stage Audio-Amplifier,** controlled by a Photoelectronic Cell that catches the projected light beam and causes the original sound waves to be reproduced in the headphone.

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